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EDITORIAL NOTES.

London County Council and Sunday Testing.

THE antics of the London County Council in respect to the Sunday testing of gas would be entertaining if they were not so regrettable, and for so many reasons. The subject came before the Council at last Tuesday's meeting, in the form of a recommendation of the Public Control Committee that they should be authorized to take the necessary legal steps to secure Sunday testing at the prescribed places. Though the proposal was opposed in a most temperate way, chiefly on the ground that it would inaugurate an amount of Sunday labour of which no man could see the end, for a purpose which did not rest upon any proved necessity, it was agreed to by the Council. So now the matter will have to be tried out in the regular way; for the South Metropolitan Company absolutely refuse to be a party to Sunday testing; and it will take all the power of the law to make them submit to it. It is scandalous that, whereas the Gas Companies of London are spending money and arranging their work in every way in order to allow their workpeople the blessing of Sunday rest from toil and care, this egregious elective body should hold their endeavours in despite, and force on this penalty testing in the avowed hope of catching them napping on the Sunday. Certain of the members of the Council who agreed to the proposal evidently felt a little uncomfortable over it, because they averred that there is no desire on the part of the Public Control Committee to resort to Sunday labour. But how such a view could be reconciled with the deed does not appear. A duly appointed gas examiner testing gas on Sundays is following his ordinary occupation for gain, and thereby breaks both Divine and human laws "by order of the London County Council." There is no other true description of such a proceeding.

Two of the London Gas Companies appear to regard the proposed Sunday testing with complete indifference, amounting to contempt. This attitude of theirs should enlighten the County Council as to the emptiness of this, their latest bureaucratic fad. But it is to be feared that the attraction of a "policy of pin-pricks" will always overpower reason for those who cherish a rooted animosity against the subjects of it. How the ruck of the present County Council regard the Gas Companies comes out in the artless remarks of Mr. H. Ward, reported by us, imputing to them a desire and intention to cheat, whenever an occasion offered. It is not the smallest of the disabilities under which the average London ratepayer lies, as compared with Provincial residents, that the newspapers that are most read do not fully report what is said or done by the Metropolitan Local Authorities. This is due to a physical impossibility, which cannot be helped; but it is nevertheless unfortunate, not on account of the intrinsic importance of much that is left unreported, but for the sake of the exposure it would make of the quality of the individuals who misrule London. These persons would condemn themselves out of their own mouths in most places in the land; but London knows nothing about them.

Very properly, the Governor of the Gaslight and Coke Company (Sir W. T. Makins, Bart.) wrote forthwith to "The Times" protesting against the man Ward's graceless behaviour; but the mischief wrought by such slanders, and by the habit of mind from which they proceed, cannot be stopped by this means. It is the lower class, and the cheap evening newspapers, that greedily fasten upon every bit of talk of this kind, which they proceed to dress up for popular consumption in their own style. We recorded, when this affair of Sunday testing arose, how one London newspaper represented it. To follow the remarks of Mr. John Piggott, another luminary of Spring Gardens, nothing would gratify the Gas Companies more than to poison their consumers regularly every Sunday. And even Mr. W. C. Johnson, who seems to know something of the subject, expressed exaggerated fears in regard to the excess of sulphur impurity which Sunday's gas might possibly contain. But if he knew a little more about it, he would find difficulty in raising so much pother over a remote possibility which is the normal state of things in the greater part of the gas-lit world. Mr. Johnson affects much concern over a grain or so of sulphur in London gas in excess of the arbitrary allowance of the Gas Referees, which makes one wonder how those unhappy folks live who have no nice, kind officials of the sort to look after their gas.

Of course, the origin of the whole affair is ascribed to the Commercial Company's interpretation of the law of gas supply as it applies to them. It is pretended that nothing but the contemplated action on the part of the County Council will meet the case. This must be a mistake. If the members of the Council who voted so gaily for going to law, and employing extra Sunday gas examiners, had to pay for these luxuries out of their own pockets, they would find some other way out of the difficulty which they have all at once recognized. Why not slip a clause into the next "Omnibus" Bill of the Council, defining the law in the sense the Council desire? There need be no litigation or Sunday testing at all, if London were governed according to the dictates of common sense, and not after Progressive prejudices.

Wage Questions in the Coal Trade.

MR. WINSTON CHURCHILL, M.P. for Oldham, has recently been asked by the Amalgamated Trade Unions of that borough to explain his vote in the early part of this year's session against Mr. Beaumont's motion in regard to the legal position of Trade Unions as discovered by the Taff Vale and other judgments. With his written defence—which is not much favoured by the majority of the Oldham Unionists—there is little fault to find; and the incident is mainly instructive as giving an indication of the pressure that will in the near future be put upon members of both parties in the House of Commons to induce them to support legislation designed to exempt Trade Unions from the operation of the common law. But there is one sentence in that part of Mr. Churchill's letter which defines his attitude towards Trade Unionism that calls for notice, as it contains an argument often advanced in favour of Trade Unions, but which cannot be substantiated. He says: "I do not by "any means share the prejudices which exist against Trade "Unions . . . because events have shown that, where "organization is the most perfect (as in the textile trades) "there strikes are most rare, and friendly settlements and "bargaining most frequent."

Immediately after reading this letter, there came before us Mr. Pickard's annual report as President of the Miners' Federation of Great Britain, and in it were found the following remarks: "During 1901, we spent on strikes £40,255. " . . I don't think it of much use to give you any warn- "ing; but it is quite clear that, *taking the strike mania as it* "*exists*, it will, if not carefully watched, prove destructive to "the Association. If you add this £40,000 in 1901 to the "£50,000 already spent this year, you will see that we have "spent close upon £100,000 in a year-and-a-half." Considering that the coal-mining industry is one in which, as regards Trade Unionism, "organization is most perfect," the fact that, according to the President of the chief Union in that industry, there exists in it a "strike mania" costing both employers and the Unions huge sums of money, makes the statement, that where organization is most perfect strikes are most rare, look singularly wide of the mark—as all who have practical knowledge of the subject know it to be.

There is, indeed, no industry in which strikes and labour difficulties are more frequent than the Union-ridden business of coal mining; and the newspapers at the present time bear ample evidence of this fact. Mr. Pickard's Federation is playing up for trouble in the most ominous fashion. The Midlands Conciliation Board—the name is rapidly becoming ironical—met, as announced, last Wednesday, with the anticipated result—namely, that the miners' demand for an increase of 10 per cent. on standard rates, and the owners' demand for a reduction of 5 per cent., were referred to Lord James of Hereford for his arbitration. Meanwhile, Mr. Pickard prepares the minds of the miners

for accepting an unfavourable decision by the Arbitrator by repeating, in his annual report, his absurd statement that the coalowners, during the "boom," made as much money "as would keep them for the next twenty-five *generations*." And then Mr. Pickard pretends to be surprised and grieved that there is a "strike mania" possessing the men into whose ears such grossly misleading and inciting statements are poured, and that the rising generation of miners—known technically as "pit lads"—have "got inoculated with the "idea that anything and everything can be got by the ask-"ing." These precious Trade Union leaders are always "sowing the wind," and then think to right themselves with the public by uttering a few tame sentences expressing hypocritical reprobation of their misguided followers when the resultant whirlwind is reaped.

At the present moment, the miners at Denaby, in Yorkshire, are garnering a sad harvest sown by their mad folly five months ago. Their furniture and homes are being sold up to pay a portion of their debts; they are under notice to quit their houses—for which they owe the colliery five months' rent—by next Saturday; the cold weather is upon them; and the labour market is overstocked. A cheerful outlook for 3000 men and families; and for what cause? For pride only—the pride of the Union. Any grievances of moment they have none, and their position is due solely to their following the advice of the local Union officials, and refusing good work offered to them by good employers—refusing it because of the intimidation of those officials. Yet we are told that good organization means, not strikes, but "friendly settlements."

In the South Wales coalfields, the negotiations are proceeding with much deliberation; but it is to be noted that, by an agreement formally entered into by the representatives of both parties last Saturday week, no stoppage of work can take place, even if the negotiations break down, until the end of February next year. In some quarters, the signing of this agreement by the employers has been regarded as a regrettable sign of weakness, and as foreshadowing a capitulation to the men's demands in regard to the main questions at issue; but we do not think that this is the true interpretation of the employers' policy. Everything depends upon, first, whether the miners' leaders are prepared to ignore the general policy of the Miners' Federation of Great Britain, and come to reasonable terms with the owners; and, second, whether they can ensure the acceptance of such terms by the general body of miners. It is an old proverb that "curses, like chickens, come home to roost;" and the Union leaders in South Wales have been so lavish in "curses" against the sliding-scale and its supporters, when addressing their followers during the past few years, that they may find those followers out of hand when they want to forget the curses and make terms with the accursed. So far, however, as can be seen at present, the chances are slightly more favourable to a peaceful settlement than to another of the terrible conflicts which, unhappily, are (*pace* Mr. Winston Churchill) far from rare in the Union-ridden coal industry.

The Parliamentary Notices.

THE Parliamentary Notices for next session are out, and it is therefore possible to gather a general idea of the prospects of activity in regard to Gas Bills. There is a fair number of such measures promised; the general increase of the demand for gas of late years having exhausted the capital powers of many companies, while others experience the need for modern statutory facilities. The Gaslight and Coke Company are challenging Fortune once more; while the London County Council are to see that Parliament has full cognizance of every aspect of the Company's position. The Company have bowed to the inevitable at last, and will throw their initial price, once held so sacred, into the melting-pot. They will also offer to take steps to redeem their dead capital; but they do not contemplate any reduction of their standard illuminating power of 16 candles to the 14 candles of the other London Companies. But inasmuch as the County Council Bill raises this very question, and seeing the likelihood of both Bills being considered together by one Committee, this matter will certainly be thrashed out. In all probability the reserve of the Company on this point does not imply any reluctance to cheapen the manufacture, but rather the practical impossibility of the Company's paying for it at anything like the excessive ransom imposed on the other London Companies. Having such large carburetted water-gas resources, and with prices ruling at the actual rates, the Company may prefer to manufacture 16-candle gas, instead of paying excessively for the privilege of doing without it, which they would not do in any event. The respective positions of the Gas Company and the Local Authority on the question of illuminating power are therefore exactly reversed from what they were in 1900, which adds piquancy to the situation of the parties. The Commercial Gas Company have given notice of their intention to raise the question of testing, which they allowed to drop last session in order to save the other parts of their Bill. The London County Council will at the same time try to persuade Parliament to alter the provisions in regard to testing of the South Metropolitan of Act, 1900; so that all this matter will be brought in question again. It is amazing how ready the London County Council are to squander a lot of money on bureaucratic fancies; and the chief consolation of this observation is that it is easier to show parliamentary combativeness than it is to obtain statutory triumphs. The Crystal Palace District Gas Company are also going to Parliament for a General Powers Bill, when the opportunity will be taken to change the Company's name for something more distinctly territorial. Several other Bills will certainly raise questions of much interest.

Verdict in the Brighton Gas Poisoning Case.

THE Brighton gas poisoning case terminated on Tuesday last in a verdict for the plaintiffs, with £500 damages for Mr. Waters and £20 for his wife. Judgment was accordingly entered for the plaintiffs, with costs; but the Judge refused to allow costs on the higher scale for the medical witnesses. Now that the case is at an end, and it is permissible to speak one's mind about the cause of action, we have no hesitation in observing that the Gas Company were thoroughly justified in defending themselves as they did. One might go farther, only it is waste of time to labour the point of the sufferer being a member of the public, and the defendants a "rich" Gas Company. This is by far the most powerful consideration with juries in such cases; and gas companies must rest content with the consequences of so natural a prepossession. The extent of the injury suffered by the plaintiffs in this particular case was evidently exaggerated; and so the Jury thought, for they cut the larger claim down to one-third of the amount, and gave the lady a compassionate allowance of £20 instead of the £50 asked for. Again, there always is this element of exaggeration in such cases; so that there is not much comfort in dwelling upon its existence in this case.

The most interesting of the questions left to the Jury were those of negligence and the damages. The verdict records that there was negligence; and it appears clear enough from the evidence what it was and where it lay. The Company are of those who undertake the fixing of gas-stoves for their customers; and these are now the majority. Certain responsibilities attach to this kind of work, the nature and possible weight of which this case will help to impress upon all those who may be concerned in like operations. There is, however, nothing to be alarmed at in this knowledge. The responsibility is not peculiar to Gas Companies. A master gas-fitter would have been equally liable if he had made the connection here instead of the Gas Company; but a sense of this responsibility never yet prevented a man from going into or carrying on the business of a gas-fitter. Besides, gas companies are under so many legal liabilities, that it would be foolish to refuse to oblige their customers for fear of incurring yet another. Any street leakage might hit the Company far harder than anything they could incur through a gas-fitting connection. Here it was ascertained that the Company's workmen did not, as a matter of fact, take all the precautions necessary and expedient to provide against leakage of gas in their consumer's house. No man is always perfect, and slips will occur in the best-regulated establishments. It behoves the careful manager to apply the lesson to himself, and pass in review the measures he is in the habit of taking to prevent mischances of the kind.

As regards the extent of the mischief done, it appears to have been divisible into two branches—injury to the sufferer's business and to his person. The former was evidently dismissed by the Jury, or they would have given more money; but they must have believed that the sufferer's personal injuries were grave, or they would not have given him so handsome a sum. There was the usual conflict of medical

evidence in the case; and where this is an element in a suit for damages, the Jury invariably give the complainant the benefit of whatever reasonable doubt exists. The proverbial inquiry of who is to decide when doctors disagree is pointless in such a connection, inasmuch as the Jury know that they are expected to do this as part of their duty. One of the considerations that always weigh with a Jury, possibly to the jeopardy of the paramount claims of justice, is that of consequential or incidental damages. A person previously afflicted with disease or bodily infirmity is more exposed to injury by accident, and is likely to suffer more and longer from an accidental injury, than a perfectly healthy and sound individual. In strict justice, perhaps, a strong and healthy man should get more compensation for personal injury than an invalid or a cripple, because the property damaged is more valuable to start with. Yet a sufferer who, by reason of a pre-existing weakness, experiences consequences from an accidental injury which a strong and healthy person would not incur, gets very pitiful treatment from a Jury. These are facts of common experience which the wise man will note for his own guidance and edification, but will not quarrel about. The gas industry at large, and the Brighton and Hove Company in particular, may be congratulated upon the circumstance that the attempt to fix blame in this matter upon carburetted water gas failed. The Judge cut the point out of his instruction to the Jury, which was a very good thing.

A Root Question of Municipal Trading.

THE controversy on Municipal Socialism and Trading is far from terminating with the conclusion of "The Times" articles on the subject, as many of those who have committed themselves to partisanship of the principle—very possibly after inadequate study and reflection—doubtless desired would be the case. Indeed, no sooner does one critic of the fashion finish his testifying than another follows on the same side. Some people fondly imagined they could dispose of the indictment prepared by "The Times" by pretending to know that it was the outcome of a regular conspiracy against English municipal institutions, and indulging in the well-worn tirade against "irresponsible" and unsigned criticism of such exalted beings as mayors and aldermen, when acting or speaking in their public capacity. Perhaps those who so object to anonymous critics will not be better pleased that the Hon. Vicary Gibbs, M.P., has taken up the task of stating the objections to municipal trading from the standpoint of one who does not believe in it Mr. Gibbs read a paper last week at a conference of the United Property Owners' and Ratepayers' Association of Great Britain, in the course of which he formulated the case for individual enterprise, and against unnecessary municipal trading, in good set terms. The author gained by admitting that he could not oppose municipal trading in every shape. Recognizing at the threshold of the controversy the utter impossibility of drawing hard-and-fast lines between enterprises upon which municipalities should enter and those from which they should be debarred, Mr. Gibbs hazarded the qualification of permissible municipal ventures, that their product should be utilized by, or tend specially to the advantage of, the whole body of ratepayers, and not merely of a small proportion of them. This sounds like a reasonable proposition; but we greatly fear that it would no more bear particular investigation than any of the other general formularies in which it has been attempted to sum up the advantages of the principle of Municipalism.

It is so difficult to say whether, or to what extent, the welfare of a community is involved in the provision of a service which only a small number can be described as actually using. Cases are easily conceivable in which the direct service of a few redounds indirectly to the benefit of the many. Mr. Gibbs proceeded to observe that municipal business should be susceptible of comparatively easy and simple conduct, and should be one that individuals themselves would not be ready to undertake, or be specially competent to deal with. It should not be of a merely speculative character, liable to frequent change, or new development in its methods of working. Every one of these postulates could be riddled through and through by the artillery of facts, or demolished by a few pertinent questions. Indeed, some of them might be put as conundrums for the amusement of students of political economy in off-hours. For instance, "When is a speculation non-speculative?" Which might be answered: "When it is a monopoly." And so on, until the search after a principle becomes baffled by a trick of language, or lost in a mire of facts.

We are reminded that recently some Provincial Lord Mayors have gone farther than Mr. Gibbs in this search after a guide to the necessary qualifications of municipal enterprise. It has been put forward by these experienced municipal hands, that every local service is suitable for municipalization, in which the monopolistic use of the public roads is involved. Their dictum is that local authorities ought to have sole control over the streets in respect to any local purposes entailing their being broken up, or partially appropriated for any purpose other than that of ordinary foot and vehicular traffic. Put still more briefly, the proposition is that no local interest other than the local authority should have any but the wayfarers' right to the use of public roads. This is a very popular prescription, often exhibited with gratifying effects by professors of the faculty of Municipalism. It has often proved efficacious in removing the last doubts of individuals as to the wisdom of the local authority incurring certain expenses, or engaging in unproved ventures with the ratepayers' money. "We must keep "our streets to ourselves!" is the cry on such occasions; and it commonly prevails. It has come to be esteemed a truism, and one that is stout enough to clinch the argument for Municipalism. It is so practical, so unexceptionable in appearance, that when used against controversialists of the order of Mr. Gibbs, who do not profess to be experts in the details of town management, it knocks them over. Their fine-spun theories cannot sustain the rude shock of the municipal master pavior.

This being the case, the principal care of the defender of individualist enterprise should be more frequently occupied with the attack of the street-paving position. Granting that this much-relied-upon aspect of the subject has an inner meaning, the question arises as to how much there is in it? What does this plea for the mastery of the streets amount to, in the cold? Very little, as a matter of fact. Of course, it does not enter at all into some questions of municipal enterprise—as that of housing. And where it does apply, what is it worth? The Corporation of the City of London do not own a single pipe or cable under the City streets. The City of Manchester own all. What is the difference? In this as in other things, municipalities are more trustworthy in supervision than in execution. Too often, unbridled municipal license to use the streets for every purpose results in unconscionable extravagance, and heedlessness of public rights. Private enterprise will get through such street works as are necessary in less time than corporation workmen; and a private owner will not run pipes and cables here, there, and everywhere for the slightest reason, or none at all. Municipal paving gangs are generally the last refuge of the destitute voter, and the first to feel the "influence" of the ward politician. That is how municipal control of the streets works out in many cases. It is the old difficulty of who is to control the controllers? Usually, things are allowed to run their course. Besides, it is very convenient when the street work of the electricity supply department, which is hard put to it, can be smuggled into the ordinary charges of the highway maintenance, or where the prosperous gas committee can be saddled with half the cost of street repairs over a generous area every time they want to lay a service. A good deal more might be brought forward to the same general effect; but enough has been indicated to support the suggestion that municipal monopoly of the streets does not necessarily benefit the ratepayer to the extent commonly taken for granted.

Hints on Distribution.

We are pleased to be able to publish to-day a valuable article on "Distribution Practice in the United States," with special reference to large cities. The author of the communication is very well known to a considerable number of gas engineers in England; but he does not desire his identity to be made public—not from any doubt on his part as to the accuracy of the statements put forward, but because he would dislike to appear as in any way posing as the spokesman for America in this matter. With the assurance that the author is fully qualified to deal with the subject, his aim in writing the article—namely, to give gas men this side an idea of how distribution work is carried on in the States—can, of course, be as well achieved without the publication of his

name as with it. This assurance we can unhesitatingly give, and so bespeak for the article the most careful consideration of our readers; only such details having been gone into as are likely to be of interest to them. The scope of the article, however, is of the widest possible character—everything of importance being included, from the governor-outlet to the burner. In this as in other matters, circumstances alter cases; and it may possibly be that, though the communication deals with what is considered good distribution practice the other side, some of the methods described might not be the most suitable for employment by gas engineers here. As to this, readers will be able to decide for themselves, after an impartial review of the *pros* and *cons;* but it will be strange indeed if they do not pick up some hints worth noting from their American brethren. At any rate, the two principal ideas kept in mind by the author's countrymen—namely, to look far ahead in providing for future needs and increase first cost with the object of lowering operating expenses, and to find out the non-consumers or partial users and keep on advertising to them in every possible way the virtues of gas—are excellent, and could be followed with advantage by everyone engaged in distribution work.

Unconscious Humour.

The unsuitability of the electric light for the illumination of market halls has been discussed in these columns on more than one occasion of late, and the lighting of the Sheffield Market Hall, among others, has been brought into consideration. It would now appear that experience of the lighting of that public mart by electricity is not the success that the Corporation, the tenants, and the public could wish for; and when the authorities come to reckon up the price that will have to be paid for the light that fails to give satisfaction, they may repent their rejection of the Gas Company's generous offer. Mr. T. B. Jones, of Dronfield, forwards us a copy of a letter that someone signing himself "Electra" sent for publication to one of the Sheffield papers; and the humour of the testimony in that letter to the indifferent character of the electric lighting of the Market Hall must be very tantalizing to those who were responsible for its installation. Passing through the hall, "Electra" inquired of one of the stall tenants what he thought of the "improvement." With the reflective air of a man anxious to be just, the tenant replied that "he did not think it was so very much worse than the old system of illumination by gas." He spoke quite seriously, so that his remark struck "Electra" as being rather funny. Another tenant was asked his opinion; and he said the hall reminded him of a badly lighted tunnel. But perhaps this criticism was a trifle too severe. However, it reveals how the new lighting is regarded. We suggest to the Sheffield Gas Company that they should invite some of the tenants to an excursion, with the Company's officials, to the Bolton Market Hall, to show them what gas can really be made to do, and what the Company would have done, in the way of market lighting at reasonable expense. The tenants might help to make things "hum" a little in Sheffield on their return.

The Value of a Phrase.

A remarkable illustration of the manner in which people are influenced by a phrase, is furnished by the proceedings of the Newton Abbot District Council. The members of this body had heard the electric light described as "the light of the future," and, fearful that they should not be thought sufficiently Progressive, they have hastened to take it up, even though it is to cost in its application to public lighting £200 a year more than an equal illumination would cost if provided by the Gas Company. The proceedings of the meeting at which this decision was arrived at are both interesting and instructive. Several months have elapsed since the subject first came under the consideration of the Council, in the form of an offer from one of the numerous electric lighting companies who are seeking to get established in the smaller towns. The Company offered to undertake the public lighting on terms which were made to look advantageous, and in which great play was made with figures of high illuminating power, if, in return, the Council would enter into a long contract. Having these figures before them, the Council suddenly awoke to the consciousness that Newton Abbot ought to be better lighted. So far as the gas lighting is concerned, the policy of the Council does not seem to have differed from the cheeseparing economy which is so frequently witnessed; but now that attention was directed to the matter, it seemed the most natural thing in the world that the town should aspire to be, as we are now assured it is to be, "the best-lighted town in the kingdom." To the credit of the Gas Company, it must be said that it met the attack of the rival Company in a really spirited manner. No effort was spared to convince the Council and the ratepayers that what the electric light could do gas could do as well and better, and very much cheaper. If the town wanted more light, the Gas Company were prepared to instal incandescent burners, and to furnish an aggregate illuminating power equal to that offered by the electric lamps at much less cost. To many people in the town, the reasonableness of the Gas Company's offer and the desirableness of securing the best result at the least expense, were apparent. But the Electric Light Company appear to have found an argument which the Lighting Committee of the Council could not resist. They carried off the Chairman and another member of the Committee for a little trip to the Isle of Wight, pointed out to them such advantages as may be discovered in the lighting of Ventnor, and sent them home convinced that there is nothing like electricity. It is true that sceptical members more than hinted the suspicion that the visit was prepared for; and it furnishes, in any case, little reason for entering into a ten-years' contract, which at the outset will cost the town £200 a year more than the Gas Company asked, and will entail further expense as additional lamps are added. However, the deputation found in the Committee and in the Council a majority to support these views, and the ratepayers must bear as best they can the burden their representatives have imposed upon them.

At Westminster.

The dull times experienced in the Committee-Rooms in the past session in connection with Gas Bills look as though they are going to have their counterpart in the next session. The Parliamentary Agents and the Consulting Engineers do not appear to be overwhelmed with prospective parliamentary work in this particular line, nor, so far as published, do the notices of Bills (fair in number though they may be) promise anything very enlivening, excepting perhaps in the case of the London gas measures. There will be quite a solid little group of Bills from London and the suburbs; but it is not expected that the Provinces will bring a large amount of work to Westminster. However, there are two or three days left yet before we shall see the end of the notices; and things may bustle up in a manner not calculated upon. While mentioning these matters, it may be of interest to those of our readers who noticed the trials made last year in some of the Committee-Rooms with electrical ventilating-fans (though they did not get a particularly good chance of fully showing their capability) to know they are regarded as so satisfactory that it is probable they will be applied to other parts of the Houses. It may be anticipated from this that the Committee-Rooms not fitted last session will be in the coming one; but there is no authority yet for saying it will be so. A liberal application of the fans in the rooms and lobbies would be a great aid to comfort on sultry days, and would be much appreciated.

Christmas Hints.

Manufacturers and trading firms are not likely to forget that the great festive season is at hand. Their letter-boxes almost daily yield reminders that this is so; and their correspondents adopt various methods of bringing the fact to mind. The communications contain hints direct and shameless, and hints indirect and cunningly framed. There are some men in superior, and many men in subordinate positions, who are sufficiently brazen-faced and destitute of self-respect to write to trading firms and mention pointedly or suggestively the fact that they have the ordering of so-and-so, and therefore it may be to the firms' interests not to forget this at the present season. A copy of this style of letter is before us; and this, the information is given, is only an example of the gross class of correspondence that is delivered to trading firms about this time. Then there is the other type of correspondent, who, with unaffected simplicity, is convinced that changes of private addresses will just now be of absorbing interest to such firms; while others, afraid to ask, yet in their greed fearful of losing, contribute to the visiting-card collections of firms doing business with their employers, who perhaps regard them as loyal

servants and altogether above suspicion. Naïvely, too, correspondents are already beginning to feel considerable curiosity as to the welfare of the heads of trading firms, and are displaying more than ordinary solicitude for their happiness during the coming month. All this must be sickening to those whose duty it is to deal with such correspondence, and make them loathe the writers. Of course, the acceptance of presents at Christmas from those with whom one's employers do business is no great sin, but the acceptance carries an understanding between the recipient and the donor, and an expectation that favour in the way of influencing orders will be the result. That is bad enough; but to beg, directly or indirectly, for presents from business houses at Christmas or at any other time is a contemptible course to which only the unscrupulous and the covetous would lower themselves. We have tried before to assist in the breaking down of this begging system; and now is a good time for the heads of undertakings to do a share in helping to maintain and raise to a higher level of purity the commercial relations between the body and branches of the gas industry. We undertake to say that there are trading firms connected with the gas industry who would be very glad to save the hundreds of pounds that have to be spent just at this season in order to ————. What shall we say?

Primitive Methods at Home.

A correspondent who last week furnished some examples of the humours of gaslight need not, it appears, have travelled to America for illustrations of the primitive methods in this department of the industry. He need not, in fact, have gone any farther than South Devon. Paignton is not exactly primitive. In some things, it prides itself on being very much up-to-date. But it is probably the only place in the kingdom in which a girl 12 years of age is employed in the lighting and extinguishing of the street-lamps. At the meeting of the District Council last week, attention was called to the fact that a child of this age was to be seen putting out the lights at midnight, being sometimes accompanied by her father and sometimes by another girl, aged 15. Why the father did not turn out the lights on the occasions when he went out, or why the girl had anything to do with so unusual an occupation for a child of so tender an age, was not mentioned. But the Council agreed that they ought to stop it.

The Crystal Palace Gas Purification Case.

It has been pointed out by Mr. E. H. Stevenson that, in our report of the Crystal Palace District gas purification case, we have wrongly recorded an answer of his to one of Mr. Ryde's questions. The question was: "Mr. Ryde: I suggest that Sir George Livesey is quite right, that the area of the purifiers at Sydenham is much greater in proportion to the make than in the case of the London Companies?" The answer as reported was: "Witness: Assuming that to be so, then the management of the London Companies is much worse." The shorthand notes taken as the answer was given are: "Assuming that to be so, then *their* management is much worse." The word "their" was altered in the transcription of the notes to "the London Companies" for (as it was thought) clearness sake; and the construction of the question seemed to warrant it. A representative called on Mr. Stevenson in reference to the matter; and that gentleman's explanation of the meaning he intended to convey by the answer may be expressed in this way: That, inasmuch as the purifying area of the Crystal Palace Gas Company was larger (in proportion) than that of the London Companies, if the latter could purify their gas satisfactorily and without creating a nuisance, then that made the management of the Crystal Palace Company much worse. Therefore, it was intended by Mr. Stevenson that the word "*their*" should refer to the defendants. It should, however, be said that, of those in Court at the time the answer in question was given, the "JOURNAL" representative was not alone in its interpretation as rendered in the report. The most natural explanation of the reply seemed to be, in view of the fact that Mr. Stevenson had been arguing for larger area for the Crystal Palace Gas Company as an actual necessity, that, as the London Companies had even less than the Crystal Palace Company have at present, then the management of the London Companies must be much worse. But that such a meaning would be attached to the reply, Mr. Stevenson assures us, was quite foreign to his mind at the time it was given.

WATER AFFAIRS.

Justice at Last.

IN a very popular farce by James Maddison Morton, in which the late Mr. J. B. Buckstone used to figure some years ago at the Haymarket Theatre, "grumbling" was defined as "complaining without a cause." The definition may not in all cases be strictly accurate, but it certainly is so in many. There are several classes of grumblers, probably the largest of which consists of the entire body of British taxpayers. Farmers run them pretty closely—in fact, they are regarded by many as the "champion grumblers" of the world. Gas and water consumers may be classed third; and among the latter those of the Metropolis stand out conspicuously. Unfortunately, their complaints easily find their way into the papers, and are dilated upon, to the detriment of the Water Companies, without any attempt being made to ascertain whether or not they are justified. It will be well within the recollection of our readers that at the time of the drought three or four years ago, when the usually abundant supply of water in the East-end had to be curtailed, the columns of the Daily Press teemed with letters on the subject from irate consumers, and exaggerated reports by writers who thought more about making "copy" that would be likely to be accepted than they did about placing upon record, for future reference, the actual facts of the case. Amid the torrent of abuse heaped upon the Water Company immediately concerned, one London paper —"The Times"—had the courage to present to the public the results of an impartial investigation into the matter, initiated by the conductors of that journal, with the result that a great deal of what had appeared in print was shown to be pure romance, and that the accounts of the wretched condition of the inhabitants of the districts chiefly affected were greatly exaggerated. Inconvenience, no doubt, was felt, but not to anything like the extent which the writers referred to endeavoured to make out. No such trouble is likely to arise again, for the carrying out of the intercommunication system has enabled the Water Companies to help each other in the event of a shortage of water arising from drought; and it may be expected that before very long a further large supply from the Thames will be available by the completion of the additional works at Staines.

This greater security of the consumer, however, does not prevent grumbling. Three years ago it was in the East; now it is in the West. The columns of the "Daily Tele-"graph" lately contained complaints respecting the water supply of a certain district in West London. The main points raised had reference to the adequacy and constancy of the supply, and the rate charged. Before pronouncing a general condemnation of the supplying Company, in one of those trenchant "leaders" for which our contemporary is famous, the conductors of the paper sent out Commissioners to ascertain, from personal investigation, how the various Metropolitan Boroughs are situated in respect of the important matter of water supply. The results of their inquiries were published in the issue for last Wednesday. They fill an entire column; and we venture to assert that never was this amount of necessarily valuable space better occupied in a daily paper, especially one with the circulation of the "Telegraph." The inquiries were made in no less than twenty-eight districts—from Wandsworth to Woolwich, on the south of the Thames, and from Fulham to Poplar on the north; and in every case but one the supply is pronounced to be "adequate," and with two or three exceptions "con-"stant." The one case in which the word first quoted does not appear is Hackney, where it is stated that there has been "great improvement in the supply since the passing "of the Act by which intercommunication of Companies' "water came in force." In Battersea the supply is "said "to be constant;" but the Sanitary Authority "would not "advise doing away with all cisterns, as there are occasional "breakdowns." However, not many complaints of inconvenience have been received by the Borough Surveyor. Particulars are given in regard to the rates charged by the various Companies; but with these we are not now concerned. What is the "conclusion of the whole matter"? We give it in the "Telegraph's" own words: "The informa-"tion tells, generally speaking, in favour of the Water Com-"panies' fulfilment of their public obligations."

We cordially thank our contemporary for instituting the

inquiry, for presenting the results in such a form that the busy man may read and quickly comprehend them, and for frankly acknowledging that those results show that the London Water Companies are conscientiously carrying out the obligations imposed upon them. Of course, this is testified to, as was pointed out by Mr. Boulnois, at the last meeting of the West Middlesex Water Company, in page after page of the last report of the Local Government Board. But a blue-book of nearly a thousand pages is not the kind of literature with which the "man in the train" generally occupies himself during his twenty or thirty minutes' run up to town in the morning; nor are the particulars in regard to the London Water Supply which are extracted from that book, and given in a concise form in our columns, likely to come under his notice, or to appeal to him very strongly even if they did. We should naturally be accused of "holding a brief" for the Companies. When, however, he reads in his "Telegraph"—his "guide, philo-"sopher, and friend," to whose opinions on all subjects, whether political or social, he attaches so much importance—a collection of facts which show him clearly that the Directors of the London Water Companies are not the dividend-grabbing, duty-neglecting plutocrats they have been represented to be, but a body of gentlemen who are conscientiously fulfilling their public obligations, he is strongly inclined to believe it, and to ask himself whether the work now in their hands is likely to be done better or more economically by the Board to whom it may reasonably be expected it will ere long be entrusted. We have never asked for the London Water Companies immunity from fair criticism at the hands of our daily contemporaries; but we certainly have looked to them for what the Companies have received from Royal Commissions, and from parliamentary and other inquiries into their conduct—justice. We think it has not always been accorded, possibly because judgment has been pronounced upon insufficient evidence. It is therefore all the more gratifying to find one of the most popular organs of public opinion in the Metropolis instituting an investigation on its own account, and coming to a conclusion which substantially accords with those previously arrived at.

Professor Lewes's New Course of Cantor Lectures.—The first of these lectures was given at the Society of Arts last night. Professor Lewes reviewed the effect of changed conditions during the past twenty years on the manufacture of coal gas; and he then went on to discuss the value of gas of high illuminating power in comparison with the low-grade gas, the supply of which has of late years been sanctioned by Parliament. These remarks were followed by a review of the methods available for the economic production of this gas, and some observations upon the effect of temperature on carbonization, and upon the use of water gas as a diluent. The lecture next Monday will bear upon the effect of lowering the candle power on the calorific value of gas, the photometry of low-grade gas, and the conditions under which its illuminating power is best developed.

British Association of Water-Works Engineers.—The winter meeting of the Association has been arranged for the 6th prox., at the Geological Society's Room, Burlington House, W. In addition to the formal business, which will include the election of office-bearers for the coming year, there will be three papers. The first will be by Mr. W. H. Humphreys, of York, on the coating of cast-iron water-pipes. The second will be by Mr. T. Molyneux, of Stockport; and it will consist of a description of the softening plant at the Stockport Corporation Water-Works at Wilmslow. The third will be by Mr. John Shaw, of Boston (Lincs.), on the detection and prevention of underground pollutions—a subject which will give the members scope for a lengthy discussion. The programme presents plenty of material to ensure a profitable meeting.

North British Association of Gas Managers.—We have received the report of the proceedings at the 41st annual meeting of the Association, held in Perth in July last, under the presidency of Mr. John Wilson, of Tradeston, Glasgow, whose portrait faces the text. This, of course, consists of the papers and discussions, embellished by illustrative plates and portraits of the writers, and a report of the general business. These matters are followed by the rules and regulations and lists of members of the Association, with the accounts. Bound up with the report is the "Statistical Report of the Gas Supply of Scotland," from July 31, 1901, to Aug. 1, 1902, by the Committee of the Association. A reproduction of the photograph taken at the Palace of Scone on the evening of the first day of the meeting, of the members and their friends, forms a very effective double-page frontispiece to the book, which has been produced under the supervision of the Secretary, Mr. R. S. Carlow. The contents of the pamphlet will be found to be as full of interest as any of its predecessors.

ESSAYS AND REVIEWS.

SIR W. PREECE ON THE SCIENCE OF BUSINESS.

At the Opening Meeting of the 149th Session of the Society of Arts last Wednesday, the Chairman of the Council (Sir William Preece, F.R.S.) delivered his Inaugural Address, which was devoted to the above subject. He began by explaining that, in his address last year, he dealt with the division of the Society's functions which embraced arts and science; and therefore he now proposed to take up manufactures and commerce, determine the causes which result in successful or disastrous financial undertakings, and show that the commercial conduct of industrial processes arising from the practical applications of discoveries followed distinct laws which might be said to constitute a "Science of Business." To this end he would survey, from a broad and general point of view, the progress of the water, gas, railway, and telegraph industries, of which he had had personal experience. When they took such industries as these, and graphically recorded from year to year the relations between capital, revenue, expenditure, and profit, they possessed a permanent and continuous diagrammatic history of the growth, decay, or conduct of the business. They had a running view of progress, and a clear indication of fall. The average growth of business per annum was the total increase during any period of years divided by the number of years. The growth would be constant and uniform if the business received equal increments in successive years; but the components of most businesses were variable quantities, and the increase per annum was itself also variable. It was, in fact, in most cases a diminishing quantity, due to the approach to saturation in the possible amount of business attainable. They could represent this growth as a diminishing percentage per annum, and this gave them the descending logarithmic curve. Sir William illustrated these remarks by means of a curve of an imaginary business. It showed that as soon as the logarithmic decrement could be determined, it was possible to forecast the business in any future period if no price-cutting rival entered the field. On the other hand, they might have fresh developments introduced which added new sources of income; and the curve might become a straight line, or even ascend. This was occurring with the electric light industry.

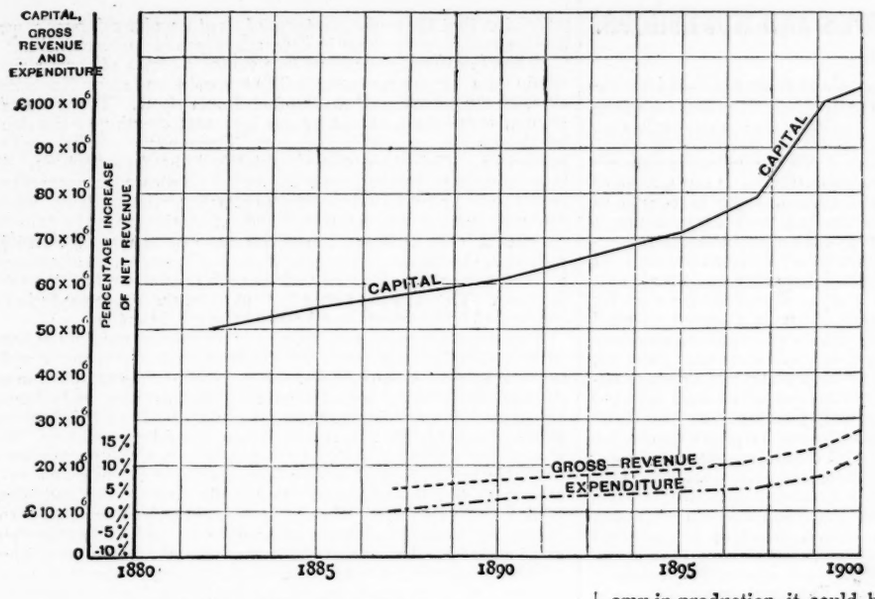
Passing on to deal in succession with the four industries indicated at the outset, Sir William remarked that the supply of water was the oldest—the New River Company's undertaking dating from the time of James the First. But it was neither a speculative nor a competitive business, as it was carried on under statutory powers. There was, however, one branch of it that was distinctly commercial—viz., the hydraulic distribution of high-pressure water for power purposes in London. The London Hydraulic Power Company was established in 1884, and its whole financial history showed how steady had been its progress, and how well its prosperity had been maintained. As to the gas industry, it commenced with the Nineteenth Century, and was in a flourishing condition of steady progress and indolence, arising from great prosperity and fat dividends, when electricity appeared as a rival in 1878, and gave its proprietors a very serious fright and a very rough shaking. It was, however, remarkable that electricity had proved the friend and not the enemy of gas. It had created an appetite for more light, and had taught gas managers that if they were to keep their businesses together they must look out for "fresh woods and pastures new." Hence, gas for heating, cooking, and power purposes had been much pushed. The supply of gas had not been checked; but, on the contrary, its rate of growth was actually increasing. The advent of the incandescent mantle had had much to do with this. Not so its profits, where the business was in the hands of private enterprise, for the diagram he had prepared illustrated a diminution. The business had been too long established to show the logarithmic law, but it shows strange ups-and-downs in variations of profit, and remarkable jumps in the increase of capital. The curves indicated the increased rate of growth in the business since the introduction of the electric light.

In connection with the subject of gas supply, Sir William gave the following statistics of the two largest London Gas Companies for the years ending December, 1896 to 1900, inclusive (the latest available):—

Gaslight and Coke Company.

Capital.	Gross Revenue.	Ratio of Revenue to Capital.	Expenditure.	Ratio of Expenditure to Revenue.	Profits.	Ratio of Profits to Capital.
£	£	Per Cent	£	Per Cent.	£	Per Cent.
10,225,000	3,540,779	34·60	2,542,818	71·5	997,961	9·70
10,301,000	3,613,586	35·07	2,613,943	72·0	999,643	9·65
10,301,000	3,832,013	37·19	2,663,001	70·0	1,169,012	11·40
22,685,840*	4,161,836	18·30	2,898,941	69·0	1,262,895	5·60
22,772,650	4,536,944	19·90	3,457,274	76 0	1,079,670	4·75

* Capital consolidated under the Company's Act of 1898.



South Metropolitan Gas Company.

Capital.	Gross Revenue.	Ratio of Revenue to Capital.	Expenditure.	Ratio of Expenditure to Revenue.	Profits.	Ratio of Profit to Capital.
£	£	Per Cent.	£	Per Cent.	£	Per Cent.
5,475,000	1,267,343	23·1	935,149	73·5	332,194	6·0
5,553,757	1,339,090	24·1	1,002,771	75·0	336,319	6·0
6,014,332	1,448,896	24·9	1,068,704	74·0	380,192	6·3
6,072,971	1,588,817	26·1	1,235,630	77·0	353,181	5·8
6,219,371	1,985,694	31·9	1,645,408	83·0	340,286	5·4

With regard to railways, Sir William expressed the opinion that the railway interests in the United Kingdom were in anything but a satisfactory condition. The ratio of profits to capital was 3·27 per cent. While capital was increasing, and the growth of traffic both in passengers and goods was satisfactory, the rate of growth of revenue was stationary, and the difference between expenditure and revenue was seriously diminishing. The consequence was that dividends were also diminishing. The most serious element of financial disturbance was competition among the great railway companies themselves. Capital had been increased without the productive increase of traffic or earning power, for the expenditure was caused chiefly by the necessity to hold one's own. What was the remedy? He was no believer in the conception that electricity was to be the panacea for every evil; for there was no sign of their being able to work main lines economically by electric traction. He suggested that the true remedy was co-operation and combination among the great railway companies themselves; and if they did not realize this fact, and set to work to put their houses in order, they would find that the last and least desirable, but most effective measure would be enforced upon them by public opinion—the financial control of the railways by the State.

Turning to the telegraph industry, and the allied subject of telephones, Sir William said the growth of the business of the General Post Office in the former obeyed the logarithmic law. There was no capital, and everything was charged to revenue. The working expenses were apparently unusually high; but if they were taken, as they should be, at a fair commercial figure —say, 57½ per cent.—the profit would be considerable. With regard to the telephone business of the country, it defied diagrammatic analysis. It had had a curse upon it from its first introduction; it was now in a state of chaotic confusion; and it had been the shuttlecock of politicians and the football of local authorities. The attempt to force it upon the municipalities was likely to prove a failure.

Sir William then went on to show that in all well-conducted businesses the profit is usually distributed to meet depreciation, renewals, reserve and redemption funds, and dividends and bonuses. Sound finance meant a right appreciation of all these points, and a due and proper allocation of a portion of the annual revenue to meet each requirement. Referring to the variability of practice in this matter, he remarked: "In electrical industries depreciation and renewals must be continuous, and must be the first charge against revenue. Electric plant must be maintained in absolutely perfect order up to the hilt, otherwise it fails to be productive, and rapidly becomes very inefficient. Hence depreciation and renewals are provided for in the ordinary annual maintenance expenditure." He pointed out that a reserve fund is essential in all growing businesses, and the soundness of the financial control is shown more by the condition of this fund than by any other monetary sign. The formation of such a fund is imperative in all undertakings dependent on moving machinery; for invention is so prolific, and improvements are so rapid, that antiquation is soon reached, and betterment is needed. It is also necessary in the case of private undertakings established under the Tramways or the Electric Lighting Acts; for in these cases the municipality has, at stated periods, the power to take possession of the business at the then value of the plant, and no allowance is made for goodwill or for compulsory purchase. Sound finance seems to show by experience that 2½ per cent. on the capital is about the average amount that should be allowed annually to form a substantial reserve.

Proceeding to deal with some matters bearing upon the general question under consideration, Sir William referred to the tendency of English manufacturers to cling to their obsolete machinery. The value of "scrapping" was not, he said, appreciated in England. In America, on the contrary, when a new process was introduced which effected considerable economy in production, it could be shown by simple calculation that it was wise and commercial to sweep away the old plant and instal the new; and this was done. But not so here. He had seen at work old Bolton and Watt machinery which absorbed annually an excess of coal and oil costing sufficient money to have justified its removal a generation ago. With regard to co-operation and combination, he remarked that there seemed something radically wrong, from a scientific point of view, in some of the gigantic "combines" which had originated in the United States. On the other hand, combinations and co-operative societies, associated with a judicious system of management, must offer considerable economic advantages in encouraging production, maintaining fair prices, securing good markets, and adjusting a margin between expenditure and revenue which would satisfy both buyer and seller.

Reference to the smarter methods of American manufacturers compared with our own led Sir William to offer a few remarks on the way in which other nations are assailing our commercial supremacy. He expressed the opinion that the crying demand of our countrymen abroad is for representatives who will make the interests of the British merchant their own. What the merchant wants to secure him an equal chance for business with the rest of the world is broad-minded and energetic Consuls. He thought there was sound cause for recommending a great deal of the American method in the constituting and working of a new Commercial Consular Service, whose motto should be "English trade and commerce first, last, and all the time." The Germans had an admirable Intelligence Department all over the world. Sir William said he had endeavoured on every occasion to point out that the retardation of commercial progress in the United Kingdom was not due so much to the want of scientific education in the men as in the masters. It was the masters who had allowed the Americans and the Germans to oust them out of their own markets—not by any superiority in the quality of their goods, but by lower prices, greater knowledge of the demands of the markets, the establishment of new markets, better direct communication with foreign countries, superior methods of business, establishing regular intelligence departments, and, above all, by possessing and exercising superior commercial technical knowledge. There was a science in business as well as in manufacture. They wanted their business men to be technically educated. Their brains must be trained as the Germans' brains had been trained—to guide their business habits by language, observation, generalization, and common sense. They must lay aside the habits of their fathers. There was no such motto as "Great Britain for the Britons." Here they were loyal to everybody but a Briton. Their industries not only received no protection, but they were retarded by internal restrictions, and their manufacturers were handicapped in every direction. It was very satisfactory to find the new Universities establishing facilities for acquiring commercial knowledge. In conclusion, Sir William said he could scarcely venture to believe that he had established his position that there was a definite science in business, and had indicated the laws of this science. He had, however, shown that diagrams, properly maintained and studied, would teach absolute facts; and it was the observation of these facts, and the deduction of laws from them, that formed a basis of science in manufactures, commerce, business, and even government itself, which, if true and followed, would retrieve our commercial pre-eminence. With these remarks, we must leave this most interesting address.

The estate of the late Peter Brotherhood, whose death was announced in the "JOURNAL" for the 21st ult., has been valued at £39,223.

VENTILATION OF FACTORIES AND WORKSHOPS.

In the "JOURNAL" for the 11th inst. there were published an extract from the first report of the Departmental Committee of the Home Office appointed to inquire into the ventilation of factories and workshops, with certain of their recommendations, and the text of one of the appendices specially relating to the effects of gas lighting on the air of enclosed spaces. The blue-book in question is full of very valuable information and observations in connection with the general subject; and we now propose to supplement our first notice with a further selection from the fruits of the labours of the Committee. It is interesting to remark that in the course of their report the Committee confirm the rule for the comfortable warming of interiors given in a recent "Note" (*ante*, p. 938), stating that in all factories and workshops where the occupation is sedentary or involves little muscular exertion, "the temperature should not be less than about 60° Fahr., particularly where the work involves delicate manipulations with the hands." The Committee very properly observe that where the gas-burners of a factory are lit for heating purposes during the day—which they call a "wasteful and objectionable plan"—the absence of proper warming arrangements is to be inferred. It is suggested that the fixing of a legal maximum limit of carbonic acid would probably conduce to the provision and use of proper heating appliances in such cases. The Committee propose that the standard of adequacy in this regard should be that of maintaining in case of necessity a temperature at least 25° Fahr. above that of the outside air, or of 60° Fahr. as already stated.

Upon this dictum, it may be remarked that to say that gas-burners must not be lighted to help warm the air of a cold morning is rather stern counsel. Nor is the expedient always so extravagant as the Committee hold—rightly enough, in a general way. It is common experience that the lighting of gas-burners, or the provision of powerful oil-lamps, takes the chill off the air of a room quicker than anything of equal availability for the purpose; although it is objectionable and extravagant to rely upon this expedient for doing all the necessary warming. Open fires, by the sharp draughts they induce, often fail to make a room feel comfortable. A supply of warmed air is the only means of conquering these draughts; and this is not usually provided. It is in this connection that the heat of gas-burners is found to be grateful. Air is easily warmed in this way, and the comfortable effect produced in an interior by even a few lighted gas-burners when a bitter North-Easter is blowing outside, is one that is sadly missed where it is not procurable. During the past week, it is safe to say that in most of the electrically lit factories and workshops of the City of London the employees have worn their walking wraps all day long.

It will have been noticed that the Committee accept without qualification the principle of judging the efficiency of ventilation by the proportion of carbonic acid present in the atmosphere, when sampled under certain reasonable conditions. The findings of the report, and the recommendations of the Committee based upon them, strike one as being eminently fair and reasonable—assuming the grounds upon which they are based are well founded. This assumption would have been granted almost without question at the time of the appearance of the report; but grave doubt has since been introduced into the very elements of all such questions by the ascertained circumstances of the recent Dartford fatality.* In this case, a stoker (presumably a robust, healthy man, in the prime of life) was suffocated on entering a stoke-hole at the Dartford Gas-Works, the air of which tested only 8 parts of carbonic acid in 10,000; and yet the man's light was not extinguished. It is stated elsewhere in this blue-book (p. 103) that a candle is extinguished "when the oxygen percentage falls below 17·5." It appears from the results of examination of the factories and workshops and miscellaneous interiors recorded in Appendix I. of the report, that air of the relative purity of that in the Dartford stoke-hole was not found in the greater number of these places. The Dartford sufferer would have died, it seems logical to think, in almost any of them. Yet there were some of them occupied by people working in an atmosphere containing upwards of 35 parts of carbonic acid in 10,000. On the other hand, we find workrooms returned as being overcrowded, when the proportion of carbonic acid in the atmosphere was down to 10·6. The case for a standard of purity based on the proportion of carbonic acid in the air is not made clearer by these facts. It is scarcely to be wondered at after this, that the column of "remarks" in the tabulated returns of examinations made by the Committee occasionally contains observations not agreeing very well with the results of analysis. Taking one example, which had been referred to the Committee as being "a specific case of bad ventilation and deficient heating arrangements." This was a brush manufactory, gas lit, with heating rings under the pitch pans. There were found to be some pitch fumes present in the air, which was not unnaturally entered as being "rather thick and clouded." Yet the percentage of carbonic acid in the air complained of was 5·7, and it did not rise above 10·3 on any day of inspection. Consequently, it had to be reported that, "apart from the fumes, the ventilation could not be said to be unsatisfactory." This finding goes to strengthen the suspicion that the unpleasantness of an atmosphere depends upon factors not accounted for in determinations of carbonic acid.

A highly interesting record is given of a series of observations made in a large provincial hall on a cold and clear November day, on the occasion of a crowded flower show. There was no regular ventilation, except by the incessant opening of the doors as the people passed in and out. There were a gallery and an orchestra. The place was electrically lighted throughout. By 7.30 p.m. the air just in front of the orchestra showed 20 parts of carbonic acid; and it was described as seeming "dense, dusty, warm, and motionless," but not so hot and suffocating as in the galleries overhead. The temperature at the same point was 66°. In the galleries, the temperature was 70°, and the proportion of carbonic acid was over 40. It was very oppressive; some ladies nearly fainting. This seems to be a typical case, showing how little the method of lighting employed affects the chief result.

The second appendix of the report contains a succinct account of what is to be understood by efficient ventilation, and is really an admirable summary of the science of the subject, quite worth getting the blue-book for. Some of the data are new, and all are to the point. It is not the least recommendation of an official publication such as this that it is absolutely devoid of padding. The Committee point out that the mere increase of the proportion of carbonic acid and diminution of oxygen to the extent met with in the air of buildings, has no direct influence on the comfort or health of the inmates. The importance of the measurement of the proportion of the former present in an inclosed atmosphere consists in its value as an indicator of the existence of conditions which do matter, both to health and comfort. Yet it is by no means easy to ascertain what these noxious influences really are. At one time, expired air was supposed to contain an organic poison; but careful experiments have quite failed to confirm this hypothesis. Neither is specific infection the source of the discomfort experienced through defective ventilation. Nor is it the heat. The Committee conclude that the mere smell of the air of a badly ventilated room is one cause of the bad effects it produces. Indeed, this appears to be the only positive objection to ventilation as bad as it can possibly be with ordinary buildings. Even when the products of the combustion of gas are added, the difficulty is to pitch upon any definite cause of offence. Neither the carbonic acid nor the aqueous vapour are offensive in themselves; so the Committee ascribe the peculiar oppresiveness of air overladen with the products of common gas combustion to the sulphur, which they consider to be "burnt chiefly to sulphuric acid." The judgment is not conclusive.

One curious discovery of the Committee is that the bacterial test of the purity of air is not of very much use. An appalling showing was made in this respect by a rope factory; but as the bacteria evidently came from the hemp and were perfectly harmless, the experiment had no particular meaning. Dust, fumes, and evil-smelling vapours of all kinds are of more importance, and should be dealt with at their points of origin. In other words, it is better to prevent a bad smell than to doctor it afterwards. This brings up the subject of escapes of lighting gas, and also of the results of the imperfect combustion of gas used for industrial purposes. The Committee are very candid about these matters, laying stress upon the necessity for preventing gas leaks, and for looking after the performance of gas-heated tools liable to "strike back." There is a very instructive chapter of the second appendix on the influence of impurities on the composition of the air, which tells what would happen if occupied and lighted rooms were not ventilated at all. If the air were not changed, obviously a time would come when combustion would stop and life would cease from the effects of their own operation. But there is always a change of air going on, so that matters never get beyond a certain degree of badness. The important point is established, that a good exchange of air is better than a large cubic space per person. In gas-lit rooms especially, there is found to be a marked relative increase of carbonic acid in rooms with a large allowance of space per head. It is clear from this that a large cubic space per person affords no guarantee of purity of the atmosphere.

A fresh contribution to the technic of the subject is given in the shape of some tables supplied by Mr. P. J. Kirkby, of Oxford, which furnish an easy means of calculating the probable maximum to which the proportion of carbonic acid in the air of a room will ultimately rise, and the rate of ventilation. Inasmuch as the conditions and requirements of ventilation for different purposes vary greatly, the Committee have wisely refrained from laying down the law as to what ought to be done in all cases. Thus, instead of recommending natural, or mechanical ventilation, or deciding between the vacuum and the plenum systems of the latter method, they give a general account of all the different ways in which fresh air is, or may be, introduced, and of the conditions which modify the effects produced. First comes a statement of how a room ventilates itself without special openings. In this connection some experiments made for the Water-Gas Committee are recounted. The larger the room, the less dependence can be placed upon natural ventilation to effect the desirable changes of the air. Whereas in a 10-feet square room the ventilation will be good enough without opening the windows, in a large schoolroom or church, nothing less than energetic mechanical blowing will serve the same purpose. While the Committee think highly of window ventilation in ordinary, they prefer that the sashes should open very near the ceiling; and

* See "JOURNAL," *ante*, p. 1353.

they point out that window opening and shutting is a business that requires constant attention. In factories, responsible persons should be told off to do it. The subject of ventilation by fans is very well treated. Indeed, this part of the blue-book is entitled to rank as a text-book on the subject of fan action, both with and without pressure. The book concludes with a particular description of the apparatus employed by and for the Committee for the determination of the carbonic acid present in the air. Altogether, an admirable volume, clearly written, thorough, and exact, without one superfluous or vague word.

EXPOSURE OF PIPES TO ESCAPING CURRENTS FROM TRAM RAILS.

THERE is probably more difference of opinion on the subject of earth-returns than on any other point in tramway practice. This, in effect, is the incontrovertible opening sentence of the final section of the long and learned contribution that Mr. Charles Hopkinson, Mr. Bertram Hopkinson, and Mr. Ernest Talbot have jointly made to the Institution of Civil Engineers on the subject of electric tramways. The paper, in respect of the portions in which we are most concerned, is of more than ordinary value, inasmuch as it tells us something, with such definiteness as experiments under actual working conditions will permit, as to the escape of current from tram rails, the conditions which favour its travel without doing harm, those which will lead to the concentration of the stray current, resulting, in greater or less degree, in damage to neighbouring iron structures, and suggestions are made as to minor improvements which could be effected in the Board of Trade regulations. Under these circumstances, a selection of points from this voluminous contribution to a subject of daily increasing importance to gas and water engineers may be profitably made.

The authors hold, as others have held before them, that it is early yet to say that the Board of Trade regulations are all, and not more than all, that is required to give proper protection to underground metallic structures. Of course, it is on this point that difference of opinion is rife; and where theorists are so much at variance, it is unlikely that practical men will be fully satisfied without actual demonstration. But this in the nature of things may not—or as the authors put it, "cannot"—be given for many years to come. But what of the pipe-owners during the process of the development (which must be constantly going on) of the demonstration? Are they throughout the period of the incubation of the proof to be exposed to wholesale injury, which the authors show is possible under certain conditions? It may be enough for the tramway owner to know that he is within the law if he complies with the regulations; but that is sorry consolation for the pipe-owner, who knows that the operations of the tramway owner may be causing his pipes to depreciate both in value and serviceability at a greater rate than before. Now this is where the two owners cross; and where the pipe-owner contends—the possibility of injury being confessed—that the Board of Trade regulations require supplementing, to protect him, his property, and the people residing in the area in which the danger lurks.

The most important of all the Board of Trade regulations is that the difference of potential between any two points in the tram-rail must at no time exceed 7 volts; and the authors consider what limitations are imposed by this requirement, how it can best be met, and then shortly the more general and controversial question whether or no it is likely that this restriction on tramway working is the best that can be devised for the purpose. But in this review of what, to our readers, is the pregnant section of the paper, we cannot enter fully into all the technical matter that the authors adduce in support of their contentions and experiment. In dealing with the point as to the electrical resistance of tram-rails, the question of the bonds comes in for treatment. This is a subject that the gas and water engineer is interested in, as the degree of electrical perfection of these bonds has an effect on the quantity of escaping current. The authors mention the Chicago bonds as used on the Leeds tramways. These bonds consist of two copper conductors, about $\frac{1}{8}$ inch square in section, and 30 inches long, fixed outside the fish-plates. In Newcastle, shorter bonds than these are used, consisting of flexible copper conductors, 8 inches long, and passing under the fish-plates. It is clear, from the figures offered for consideration in connection with these bonds, that a good deal of the current goes through the fish-plates and sole-plates. In course of time, the fish-plates will loosen somewhat, and rust will get between them and the rails; and they cannot be got at and tightened up as on a railway. The contact of the bonds and the rails is also fairly certain to deteriorate in some cases. Under these circumstances, and from other points of view, the authors pronounce in favour of solid joints, which possess great advantages. The best known of these is the Falk cast-welded joint, which has been considerably adopted in America. Really this form of joint consists of a cast sleeve shrunk round the ends of the rails; but here again the authors believe the joint is not always electrically perfect, doubtless owing to the existence of a film of non-conducting scale between the rails and the cast-iron jacket. They, however, also refer to the "thermit" welded joint, with which they have been experimenting. "Thermit" is a mixture of aluminium and sesquioxide of iron in molecular proportions; and this mixture is run into a mould round the joint, as in the Falk system. In the case of the "thermit" joint, however, the iron is so hot that there is always true union between it and the rail, in spite of its small mass—only about 13 lbs. per 100-lb. rail. The experiments show that this joint is of ample strength, having regard to the stresses to which it is subjected, if not as strong as the solid rail. The authors' preference for the solid joint raises the interesting point as to the effect of temperature upon the welded track. In their opinion, it is probable the strains due to variations of temperature in a buried tramway rail in this country are never more than can be met by the elasticity of the rail.

Turning later in the paper to the practical question of compliance with the Board of Trade regulations as to drop of potential in the rails, the authors refer to the results of tests on the conductivity of the rails and bonds in use at Leeds, from which the resistance of the metallic circuit can be calculated. That circuit, however, they point out, is buried in the earth, through which some of the current is diverted—thus diminishing the drop of potential in the rails. To determine how far this affects the question, experiments were made on the electro-motive force required to pass a current from one point to another on the rails. In one test, a current of 310 amperes was fed into the rails of the tramway at a feeding-point called X and taken out at a feeding-point called Y. The drop of potential between the two feeding-points was 5·2 volts. Had the rails been insulated for the whole of their length, the drop would have been 6·5 volts; so that, in this case, the drop was the same as if about one-fifth of the current was diverted to the earth. In another case, the same current was put in at a point called C, and taken out at F with an electro-motive force of 5·8 volts. Had all passed by the rails, 6·9 volts would have been required; so that in this case about a sixth went through the earth. The conclusion drawn from this is that the reduction of the rail resistance due to the earth is not very important, and may well be regarded by the engineer as a margin to be neglected in his calculations.

Skipping a discussion of the methods of returning current, we arrive at further experiments which have a more direct interest for our readers. With the object of ascertaining, if possible, what became of current leaving the rails, when passing a constant current between the two points X and Y. The distribution of current and potential in the rails was also determined. It was found on calculating the drop of potential between X and Y from the observed values of the currents at intermediate points, and allowing 5 per cent. additional length of rail for the bonds, that the calculated value came to 5·05 volts, against 5·2 volts observed in the power station—a difference of 3 per cent., which is probably largely accounted for by uncertainty in the bonds. We are not at liberty to reproduce the map which throws light here on the authors' explanation of these particular experiments; but mention of the before-mentioned points X and Y, and a little later of certain roads at Leeds, will perhaps be a sufficient guide to the meaning and value of the figures quoted. It was ascertained that 60 amperes leave the rail in the $1\frac{1}{2}$-mile track west of X; and some current—about 30 amperes—also leaves the rails between X and Y. Practically, the whole of the 90 amperes enters the rails again east of Y—showing no marked preference for any part of the system, but spreading out all over the city, though no doubt more current gets in near Y than at a distance from it. The first question to be settled by the investigators was whether the current encounters any electrolytic electromotive forces in its passage through the earth, or whether it finds the earth substantially the same as a metallic conductor. Careful measurements of the potential between X and Y were made for different currents; and it was found that the resistance between these points was the same for currents of 300 amperes and 150 amperes—certainly within 1 per cent. It follows from this that the 90 amperes leaving the rail out of a total of 300 amperes do not encounter a total electrolytic electromotive force exceeding, on the average, about $\frac{1}{6}$ volt. Of course, remark the authors, it may be that (say, four-fifths of the 90 amperes go through the earth without having to overcome any electrolytic electromotive force at all, while the remaining one-fifth enters and leaves a gas-pipe. "The experiment, then, proves that the electrolytic forces set up by this fifth in so doing cannot exceed 0·7 volt in the aggregate."

The authors investigated the distribution of gas-pipes in the neighbourhood of the rails carrying the current. The most important of the pipes are a 10-inch main running along Stanningley Road—that is, quite close to the path of the main current between X and Y—and a 12-inch main, which enlarges to a 16-inch at a little distance. The distribution of return current east of Y does not, in the view of the investigators, seem to depend upon the pipes in any way. It would, indeed, they remark, be rather surprising to them if the current did enter the pipes to any considerable extent. It is in the soil immediately surrounding the pipe that a current passing into it, or leaving it, encounters the greatest resistance; and, consequently, the current leaving the rail at X will spread out and go straight through the earth to the network of rail on the other side of Y. To put the authors' contention shortly, once the current has got clear of the rail, and has spread itself out so that its density is exceedingly small, it can travel long distances through the earth without much fall of potential, and it has no tendency to contract again in order to enter a pipe. Such current as does enter the pipe must do so, they maintain, at exceedingly low density. In the mile of track

at the western end of Stanningley Road, 50 amperes enter the earth. If, they say, the whole of this current were to go into the 10-inch and 12-inch gas-main, over a distance of 1 mile at uniform current-density, that density would be about 1·8 millionths of an ampere per square centimetre. As it is quite certain that only a fraction of the 50 amperes gets into the pipe, the average current-density over the last mile of pipe is a good deal less even than this. Now, so low a current-density is, the authors assert, quite incapable of causing any serious electrolytic action. Hence, if such action takes place, it can only be due to the presence of limited strata of earth having much higher conductivity than the average. For example, the authors suppose that a pipe is laid in sandstone rock, except for a vertical stratum of clay a few feet thick soaked with salt water. This stratum might conceivably have a conductivity a thousand times as high as the rock. In this event, the current-density where the pipe passes would be measured in thousandths of an ampere per square centimetre, instead of in millionths; and electrolysis, with serious corrosion, would result if the currents were in the right direction.

Then the authors, assuming the existence of such a stratum, estimate the potential required to produce electrolysis. The resistance of the clay might perhaps be 1 ohm per cubic metre—at all events, it would be its order of magnitude. Taking that figure, an electromotive force of 0·46 volt between the earth in contact with the 12-inch pipe, and 10 feet away from its surface, would produce a current density of $\frac{1}{100000}$ ampere per square centimetre over the surface of the pipe. Opinions differ, it is pointed out, as to whether such a current-density is dangerous. If its electrolytic effect were the same as that of currents of higher density, the pipe would be corroded to a depth of 1 millimetre per annum.

But after all this, it is interesting to find the authors do recognize the possibility of the occurrence of trouble. They say: It is, however, probable that in soil wet with electrolyte, the current density is far from uniform. The current will follow the electrolyte, passing round the non-conducting particles of soil with which it is mixed. This will lead to concentration of the current at the points on the surface of the pipe which happen to be in contact with the liquid, with consequent pitting at these points. The remainder of the pipe, being in contact with particles of soil, will be protected. But, if corrosion does take place, it must be accompanied by an electrolytic fall of potential between the earth and the pipe, which will amount to (say) $\frac{1}{2}$ volt. Assuming the limit of 7 volts between the points X and Y, there will remain a balance of 6 volts for getting the current out of the rail to a point 10 feet away from the pipe, then along the pipe, out of it at the far end (this time at very low current density, so as to cause no electrolytic fall), and into the rail again. These figures might quite possibly be realized; and in that case there would be corrosion with the 7-volt limit.

The authors' conclusion is that, in the presence of strata such as that described, the 7-volt limit may be too high, but that, in their absence, it may be largely exceeded with perfect safety. Smallness of the extent of the conducting strata, and their very high conductivity compared with the general mass of the soil, or some other cause capable of concentrating the earth currents, and focussing them on small areas of the pipe are the necessary and sufficient conditions for the production of electrolytic corrosion. The other rule of the Board of Trade, which is in effect that the difference in potential between a pipe and the rail at a point where the current leaves the former and enters the latter shall not exceed 1·5 volts, is, in the authors' view, subject to the same remark as the 7-volt rule—viz., that it is an unnecessary restriction, except where there happen to be strata capable of concentrating the current. In the presence of such strata, however, it is probably a greater safeguard than the 7-volt rule, because it gives more direct, and generally closer limitation of the current density over the pipe's surface at the point of danger.

After the paper was prepared (which, by the way, in print runs to 44 octavo pages), one of the authors—Mr. Bertram Hopkinson—made further experiments, which amplify the conclusions stated above. As the authors set themselves to show, the danger of corrosion in a metallic structure underground, by reason of stray electric currents, depends solely on the current density at points where such currents leave the pipes. At these points, the investigator states, ferrous salts are formed; the iron being eaten away at the rate of rather over 1 grain per ampere-hour, or about 1·3 millimetres per ampere-hour per square centimetre. The proper way of protecting pipes, therefore, is to limit the current density at which stray currents leave them. This is the ideal, he says, to be aimed at; and it is necessary to begin by fixing a maximum permissible current density. A fair limit is probably $\frac{1}{3}$ ampere per square metre. This, if the ordinary law as above stated holds, and if it be continued throughout a tramway year of 7000 hours, would corrode a pipe to a depth of 0·5 millimetre. If this figure be fixed as the maximum, the mean will, of course, be a good deal less; and an ordinary pipe 5 millimetres thick may be expected to last 15 or 20 years at least. Following the authors' experiments, he is found to assert that dangerous corrosion can always take place with an electrolytic fall of potential between pipe and rail of 0·25 volt. Consequently, the Board of Trade rules only safeguard pipes in so far as, by reason of the resistance of the soil, they limit the current-density. This resistance, of course, depends on the circumstances of each particular case; so also does the effect of the rules. Assuming, he says later on, the maximum current density in any area such as a square metre is not more than five times the average, the current density rule must be so far amended as to read that the average current density over such an area must not exceed 0·1 ampere per square metre.

The 7-volt rule, in the investigator's opinion, is defective in that it has no reference to the distance over which the 7 volts are measured. A fall of 7 volts over 3 miles of track is almost certainly harmless; but if it be distributed over $\frac{1}{4}$ mile, it will probably cause corrosion. It would, it seems to him, be better, and quite as easy a test to make, to restrict the fall of potential to (say) 2 volts per mile of track, with an absolute upper limit of (say) 10 volts, instead of imposing the limit of 7 volts independent of the distance. The Leeds experiments show that there the currents leaving the rails do not exceed 50 amperes per mile of double track, which, if distributed over the surface of a pipe 4 inches diameter, would amount to under 0·1 ampere per square metre, as only a fraction of the current gets into the pipe, and the larger the pipe the less, of course, will be the density. It is clear to Mr. Hopkinson that the 7-volt rule, or the slight improvement that he suggests, confers protection on pipes 4 inches in diameter and upwards, if there be no concentrating strata, simply because, *if* the rule be observed, the current getting into the earth is not enough to corrode the pipe, even if it all goes through the pipe. Then he also indicates a possible substantial improvement in the 1·5-volt rule—viz., to make the maximum permissible potential between pipe and rail depend upon the size of the pipe—say, to allow 0·2 volt per inch diameter of the pipe. The rule, he believes, would then be usually a sufficient protection, except in cases where the distribution of soil is such as to focus currents on small areas. The 1·5-volt rule, as it now stands, appears barely stringent enough to protect small pipes laid in clay or other highly-conductive soil. It also seems probable to the author that, where a pipe crosses the rails at right angles and close beneath them, the current density may attain a dangerous value.

To sum up, it is clear that the view of Messrs. C. & B. Hopkinson and E. Talbot is that, though not very logical and capable of improvement, the Board of Trade rules seem to be fair practical safeguards against electrolysis; but there are almost certainly cases where strata of clay in the midst of gravel tend to concentrate the currents, or where small pipes cross the track or close beneath it at right angles, in which the rules are not a sufficient protection. Upon this it may be submitted that the authors have advanced an ample case (mildly stated though it be) for the amendment of the Board of Trade rules, and a justification for the claim of pipe-owners to protection—at all events, for pipes laid in clay or other highly-conductive soil. The paper carries conviction that the experiments have been carried out with due care, and that the results are frankly stated. It is certain they will have powerful weight in future investigations and consideration of the subject.

ELECTRIC LIGHTING MEMORANDA.

Telephony at Tunbridge Wells.—An Audacious Deputation.—A Chilling Reception.—Setting in of a Municipal Trading "Rot."

THE affairs of the Tunbridge Wells Corporation, in the matter of municipal telephony, are attracting a touching amount of solicitude on the part of a number of gentlemen who have no business whatever with the finances of this pleasant town. So much is to be gathered from the circumstance that on Thursday last a deputation largely composed of strangers to Tunbridge Wells, but claiming to be "interested in municipal telephone undertakings" elsewhere, waited on the Postmaster-General to coolly ask that his assent should be withheld from the agreement which has been entered into for the sale of the Tunbridge Wells Corporation telephone system to the National Telephone Company. True, the deputation was supposed to be an outcome of the operations of the Protest Committee that has been formed in the town with the object of opposing the action of the Corporation; but it was "introduced" to the Postmaster-General by Mr. Thomas Lough, who does not represent any constituency nearer to Tunbridge Wells than the North of London, where they have no municipal telephones. The case against the Corporation was expounded by a member of the London County Council; and it was supported by the Lord Mayor of Manchester and other gentlemen from a distance, whose views of the Tunbridge Wells Corporation telephone system apparently exhibit the well-known effect of this condition. The truth of the matter is, that this somewhat sensational conclusion of a thrilling tale of municipal enterprise has spread consternation among the advocates of municipal trading everywhere. The idea of a local authority being resolved to retrace their steps in an affair of this kind, because of the probability of losing the money of the ratepayers, is so utterly foreign to the principles of Progressivism in municipal administration, that certain representatives of these principles must have decided that they ought to do something, even at the hazard of being told to mind their own business.

The step these Progressives decided to take is of a piece with their usual performances. They profess in general the most complete trust in "the people," in the first place, and in local government institutions afterwards. Yet, whenever the people exhibit the smallest disinclination to be driven along the path they would

have them tread, they resort to other means to gain their ends. And where the machinery of popular government fails them, they will run to those superior powers whose interference in such affairs they ordinarily condemn. Thus the Lord Mayor of Manchester, and the chosen of West Islington, did not propose to lend their valuable help in any way to the Tunbridge Wells ratepayers, in order that the apprehended consequences of an ill-advised municipal speculation might be staved off or mitigated, in the interest of those who would have to bear the loss; but they asked the Government to step in and deny to these ratepayers the way of escape found for them by their own representatives. It is a proceeding that does not lack audacity. The Postmaster-General heard the deputation patiently, being doubtless desirous to consider the question at issue from every point of view. He was polite enough to grant *locus standi* to the gentlemen from all parts of the country who had been so good as to advise him what to do for Tunbridge Wells, and delivered a straightforward answer, which is well worth considering, even though it was not, and could not be, conclusive on the merits of the matter.

To begin with, Mr. Austen Chamberlain divided the members of the deputation into two sections, and dealt with their cases separately. Turning first to the local malcontents, who wanted him, as the head of a Government Department, to overrule the deliberate action of the Local Authority, he told them flatly that he did not regard it as his duty to constitute himself a Court of Appeal from a town council dealing with a matter of purely local concern. This party disposed of, the Postmaster-General asked the outsiders what their business was in this particular galley; and he answered himself that the principal fear of Manchester appeared to be "lest Tunbridge Wells should be cited as a failure in municipal competition." Rather a far-fetched qualification for a Corporation deputation to interfere in the concerns of another Municipality! What credentials has Manchester, to warrant the Lord Mayor in posing as the mentor of Tunbridge Wells? The Postmaster-General as good as told this nervous pilgrim to wait until the local interests of his own neighbourhood were involved. Mr. Chamberlain positively refused to interfere with the exercise of their discretion by the proper representatives of a corporate town. A nice hornets' nest he would stir up if he were to venture on such an extra-ministerial course! He went on to define the Government interest in the subject as limited to the national aspect of it—particularly as to the question of licensing. With this the deputation had to be content; and they accordingly went their way to hold a meeting at which they professed not to feel discouraged by the cold douche which they had experienced at St. Martin's-le-Grand.

These and other professed Progressives may "make believe" to the top of their bent, and tell one another that all is well with the principle of municipal trading in general and the telephone department in particular. They have need of all their well-known persistence in this cause, though one may venture to think that Mr. Lough did no good by abusing the majority of the Tunbridge Wells Corporation in catch-phrases for doing what they are perfectly entitled to do. What he and his associates of the deputation have to fear, is lest this example of Tunbridge Wells should prove to be the commencement of a "rot" throughout the country among local authorities who have blundered into disastrous commercial enterprises; and they know it. There is always something contagious in the fashions of local government. The local authorities of the country habitually follow one another like a flock of sheep. This is notoriously so; and the tendency is played upon by every touter for fat municipal contracts. It was so in the matter of electric lighting; and it is so in respect of electric tramway working and telephony. It would be the same with wireless telegraphy to-morrow, if the conditions were favourable. Up to the present, no local authority enticed into an unnecessary and unprosperous undertaking has had the courage to make a clean breast of it, and cut the loss in any available way. There must be many such who would be only too glad to be quit of their electric lighting obligations, if it could be done quietly. They want such a lead as Tunbridge Wells has given them; and when they begin to follow it, they will make quite a crowd.

The Rating of Machinery.—At the Auctioneers' Institute, last Wednesday, Mr. D. M. Faraday read a paper on this subject. He said it was surrounded by such complexity of views that it was thought a discussion upon the question of "How machinery is to be taken into consideration if it enhances the value of hereditaments in which it is *in situ*," might solve many knotty points. The assessment authorities urge that this can only be ascertained by finding the actual value of the machinery. Mr. Faraday thought that half the difficulty would be overcome if the valuer remembered that the whole of the assessment law is based on a hypothetical assumption. The question was: "What would a tenant give as rent for a hereditament for the purpose for which it is now used?" The speaker argued that all the machinery in any factory makes that factory what it is, and therefore the only conclusion that one can come to is that it must be taken into consideration where it is found in use; and it has to be treated for rating purposes as passing by a demise from the landlord to the tenant. Mr. Faraday showed how impossible it would be to say how much buildings were enhanced by the presence of machinery if a valuation thereof were not made.

ANOTHER CHECK TO TRADE UNION HIGH-HANDEDNESS.

Two judgments of importance, as bearing upon the somewhat intricate question of the legal rights of unions of employers or employed, in regard particularly to actions taken by such unions by way of interference with the employment of individual men by individual employers, were delivered on the 4th inst.—one in the Court of Appeal, the other in the King's Bench Division. The first case, that of *Read v. Friendly Society of Operative Stonemasons and Others*, was an appeal by the defendants from the decision of the Court of King's Bench (noticed in the "JOURNAL" for May 6) upon an appeal from the Ipswich County Court.

The plaintiff Read, after being employed for three months as a labourer by a firm of stonemasons, entered into a deed of apprenticeship with them in August, 1900 (when he was 25 years of age), covenanting to serve for three years at 15s. a week in return for being taught the craft of stonemasonry. This firm of employers (Messrs. Wigg and Wright, by name) had subscribed to certain rules drawn up by the defendant Society for the regulation of the relations between the members and their employers. One of these rules provided that no one should enter the trade without being legally bound as apprentice, and in no case be more than sixteen years of age, except the sons or stepsons of masons. Read was the son of a mason, but was not a member of the Union. Immediately after the deed of apprenticeship had been executed, the Union—on the ground that Read was over sixteen years of age—resolved that if he started work as an apprenticed mason the members of the Union should at once hand in notices and go on strike. In consequence of this threat, the employers never taught Read the trade, but kept him on at work as a labourer until May, 1901, when they wrote a most humble letter to the Union, apologizing for having "inadvertently taken an apprentice contrary to the rules of your Society (for which we are very sorry)"—to such a pass have some employers allowed themselves to come—and suggesting that as they had, through interpreting the rule in its obvious sense, but differently from the Union, taken Read as an apprentice, he should be allowed to finish his time.

The Union—which took, or pretended to take, the extraordinary view that the exception (in the rule as to apprentices) in favour of masons' sons only applied to the question of their being allowed to enter the trade other than as apprentices—refused to alter their attitude, and replied that if Read began work as an apprentice their members were empowered "to take prompt action in the matter." In answer to an interrogatory, the defendants' Secretary said that this meant "give two hours' notice and leave the employ." As a consequence, Messrs. Wigg and Wright, who appear to have been in helpless dread of the Union, dismissed the plaintiff, who therefore "lost the opportunity, which he was lawfully entitled to, of emerging from the position of a labourer at 15s. a week to that of a mason who may earn up to 35s.," and accordingly brought an action against the Union for wrongfully and maliciously inducing Messrs. Wigg and Wright to break the contract of apprenticeship, and for maliciously conspiring to procure the contract to be broken. He claimed damages and an injunction. The County Court Judge found that the defendants had acted *bonâ fide* in the best interests of the Society of Masons, and had not been in any way actuated by any improper motives. Plaintiff appealed. Justices Darling and Channell held that there ought to be a new trial; while the Lord Chief Justice considered plaintiff entitled to judgment. Defendants appealed, and plaintiff cross-appealed asking for judgment with damages. The Court of Appeal unanimously found in favour of the plaintiff, and awarded him £50 damages. The Master of the Rolls read a long and most interesting judgment, the essence of which was as follows.

The plaintiff was entitled to the benefit of the contract he had made, and that benefit he would have enjoyed but for the intervention of the defendant Union, of which he was not a member, and by whose rules he was, consequently, neither legally nor morally bound. The defendants conspired to compel, by threats of a formidable character, his employers to break their contract with him; and the only justification pleaded by the Union (apart from that they were acting *bonâ fide* for the benefit of the Society) was that the employers, by subscribing to the Union rules, had undertaken a prior obligation to the Union (of doubtful legal force, if not actually illegal) not to make such a contract. But the only remedy possessed by the Union if that obligation were enforceable was by way of legal action against the employers. To combine, instead, to coerce them by threats to break their contract was "an illegal act carried out by illegal means." If the obligation undertaken by the employers to the Union was not enforceable at law, the Union were without legal remedy. Their conduct demonstrated that their object was to defeat the plaintiff's purpose of becoming a mason. "Belief, however honest, that in what they did they were acting in the best interests of the Society of Masons could be no excuse for conspiring to deprive the plaintiff of the advantages of his contract. . . . The action of the defendants was clearly malicious. . . . The use of illegal means evidenced malice; and in this connection malice was not equivalent to 'without just cause.' The cause of intervention might be just; but the means used to enforce it might be illegal."

This is an important doctrine; and the Master of the Rolls laid

stress upon it. "It is," he said, "very desirable to guard against the notion that, if the act done be illegal, 'just cause' may still be averred to purge the wrong." This is in accordance with Lord Watson in *Allen v. Flood*, confirmed by Lord Macnaghten in *Quinn v. Leathem*. "There are," said Lord Watson, "in my opinion, two grounds only on which a person who procures the act of another can be made legally responsible for its consequences. In the first place, he will incur liability if he knowingly and for his own ends induces the other person to commit an actionable wrong. In the second place, when the act induced is within the right of the immediate actor and is therefore not wrong as far as he is concerned, it may yet be to the detriment of a third party; and in that case, the inducer may be held liable if he can be shown to have procured his object by illegal means."

After considering these arguments, it is easy to follow those upon which the Lord Chief Justice founded his judgment in the second case to which we have referred above, as having been decided last Tuesday week. This was an appeal by the plaintiff from the decision given at the Blackpool County Court in the action of *Bulcock v. St. Anne's Master Builders' Federation and Others*, the facts of which may be very briefly stated. Bulcock was employed by a firm belonging to the Federation. The firm gave notice of a reduction in wages; the men ceased work rather than accept the lower rate; and the plaintiff subsequently obtained employment with another firm, belonging to a Federation of builders which, as well as the St. Anne's Federation, was affiliated to the Lancashire and Cheshire Building Trades Society. This Society had a rule that no member should employ a workman on strike or locked out from the shop of another; and when the plaintiff's original employers found that he was being employed at the shop of a firm belonging to the Society, the St. Anne's Federation requested the Head Society to obtain his dismissal. His employers were thereupon informed of the facts by the Society, and dismissed the man, who then brought an action against the St. Anne's Federation for wrongfully and maliciously procuring his dismissal. The County Court Judge decided against him. He appealed; but his appeal was dismissed by the Court of King's Bench.

The Lord Chief Justice, in giving judgment, pointed out that there was no evidence that the defendants used unlawful means to procure the dismissal of the plaintiff, nor that their purpose in so doing was to injure him. It was entirely to further their own purposes; and the employers who discharged the man did not do so as a consequence of threats, but as an act of loyalty to the Society to which the federations belonged. They might have had in their minds the possibility of trouble with the co-federated firms if they did not comply with the rule; but no threat of such trouble was held out to them. Moreover, there was no breach of contract. The man was dismissed in the ordinary course. If the purposes of the defendant Federation, or the means used to further them, had been unlawful and caused damage to plaintiff, he could have recovered; but the facts being to the contrary, the appeal was dismissed, leave to appeal further being given.

These two judgments, consistent and based upon sound principles, are eminently satisfactory to those who desire to see Trade Unions confined by the operation of the common law to their proper sphere; and it is to be hoped the finding of the Court of Appeal in the case of *Read v. Friendly Society of Stonemasons* will constitute a salutory check upon the intolerant high-handedness of some Unions, and serve to impress upon them the fact, which they so often forget but of which the Master of the Rolls took occasion to remind them—namely, that they "have no higher immunity from legal obligations than any other members of the community, and if they have legal rights, they can enforce them by legal means only."

ARBITRATION IN LABOUR DISPUTES.

THE argument often put forward by the good people who imagine that in Trade Unionism lies the salvation of the working classes—namely, that employers who really wish to do justice to their employees welcome the presence of a Trade Union, as constituting a responsible body representing the workers in the trade with whom they can negotiate when differences arise—has received one or two rude shocks of late. Not long ago, the special correspondent of "The Times" at Grimsby showed how completely this theory of the Trade Union as "a responsible body" has broken down in the case of the fishing industry at that port, where all the fishermen belong to the National Union of Gas Workers and General Labourers of Great Britain and Ireland, to give that feeble body its important-sounding title in full. In June last a formal memorandum of agreement between that Union and the Grimsby Federated Owners Society was entered into, referring to arbitration, in accordance with the provisions of the Arbitration Act, 1889, two questions in dispute between the smack owners and the fishermen. An arbitrator was appointed by the Board of Trade, and an elaborate inquiry was held, at which both sides were legally represented. The resultant award was wholly in favour of the owners on both questions. The men promptly refused to accept the award, held a meeting at which it was put to the vote, and, by 288 votes to 18, decided not to work on the lines therein laid down by the Arbitrator; their real objection being that the award did away with a corrupt practice whereby they obtained from the fish buyers payment for giving them excessive measure at the expense of the owners.

The subsequent proceedings of the Gas Workers' Union are highly instructive. The Owners' Federation called upon the Union to take steps to get the award accepted, and to expel the recalcitrant members if they persisted in their repudiation of the agreement made by the Union. Mr. Thorne (the Secretary) replied that he and Mr. Curran (the President) had endeavoured to persuade the men, but without success, "so that, as free and unfettered British subjects, they have chosen their own course;" further remarking that "when we organized the men, we gave no guarantee either to the owners or the public that we could enslave them." No steps were taken to expel the men from the Union. What have the arm-chair believers in the assistance given by Trade Unions to employers in the settlement of disputes to say to this clap-trap and procedure?

About the same time as the Grimsby repudiation took place, the men at a Yorkshire colliery went out on strike against an unfavourable award made by Arbitrators to whom the Union had agreed to refer a small dispute; and, as noted in the "JOURNAL" last week, those men—some 3000 and more—have now been idle for about five months. On the top of these instances comes the repudiation by the French Miners' Union of the decision of the Arbitrators with whom they agreed to leave the settlement of the questions at issue. The force of public opinion has, it is true, since compelled the men to return to work; but the object-lesson is not thereby affected. These several instances, coming one after the other, ought to open the eyes of the public to the fact that employers are fully justified in refusing—as they are often held up to scorn for refusing—to refer matters vitally affecting the welfare of their businesses to the uncertainties of arbitration, and have also justification for their refusal to "recognize" the Trade Unions as intermediaries between them and their men.

To the other and sufficient reasons for objecting to grant a *locus* to a Trade Union in his shop, the employer can add the final one, that he has no guarantee that if he does negotiate with the Union it will or can enforce agreed terms upon men who do not relish them; while as to arbitration, he can justly say that this is most generally proposed by the men when they have no real grievance, but hope to get some concession from the arbitrator (who is not unlikely to give the men something on the common, but often absurd, plan of "splitting the difference"), and that if the award be a clear one in his favour, he has no certainty of its being accepted by the other side.

Concrete examples, such as those we have instanced, weigh with employers more than unlimited quantities of theory, in estimating the true value of Trade Unions.

THE GAS AND WATER STOCK MARKET.

(For Stock and Share List, see p. 1421.)

THE Stock Exchange had another agitated week in that which closed last Friday (the House being shut up on Saturday for building operations to be effected), and the tone of the markets was very fluctuating. It opened with a rather mixed state of things, some up and some down, and grew rapidly worse. By Wednesday, everything was as flat as could be. But soon a partial recovery set in; and, at the close, the general position was fairly good. The continued abstention of the public, painfully evident in their avoidance of the two Colonial loans, is a disagreeable feature; and professional speculation is giving rise to some uneasiness anent the settlement this week. In the Money Market, rates stiffened to a marked degree, and there was a strong demand for accommodation. Business in the Gas Market was only very moderate. Most of it was in the issues of the largest Company, and nothing else was much dealt in. There were a fair number of changes in quotation; but they were only inconsiderable in extent, and there were about as many in the upward direction as in the other. In Gaslight and Coke issues, the ordinary was a little weaker, and dropped rather suddenly on Wednesday to $87\frac{1}{2}$. But that figure was not repeated; and the quotation only fell a single point. The secured issues were unevenly treated; the preference gaining a point, while the debenture receded to a similar extent. Very moderate business was done in South Metropolitan, and the prices marked were steady; but the quotation was put down a point nevertheless. Again there was not a single transaction in Commercials. Only two or three were marked in the Suburban and Provincial group. Crystal Palace debenture recovered its lost point, and Tottenham "B" also had a recovery. A transaction at figures well below the quotation was marked in British; but the quotation was left unchanged. On the local Exchange, Sheffield "A" recovered the point it had lost the preceding week. Moderate business only was the record of the Continental Companies; but the tendency was more promising. Imperial commanded good prices; and there was an advance in Union preference. None of the remoter undertakings moved. The Oriental Company's stock now comes into quotation after considerable delay. The Water Companies were still in a cheerful mood, and some of them had a material advance.

The daily operations were: Gas was very quiet on Monday.

Crystal Palace debenture rose 1. Nothing in Gas moved on Tuesday; but in Water, West Middlesex and Lambeth 7½ per cent. gained 2½ each, and East London 1. Wednesday was the busiest day of the week. Gaslight ordinary and debenture and South Metropolitan fell 1 each; but Gaslight preference and Tottenham "B" rose 1 each, and Union preference 1½. Gas was unchanged on Thursday and Friday. In Water, Lambeth rose 1, ditto 7½ per cent., and West Middlesex 2½ each; but East London receded ½.

PERSONAL.

Mr. J. H. CROWTHER, of Wallasey, has been appointed Gas Manager and Secretary to the Barnoldswick Urban District Council.

Mr. A. DAVIS has been appointed Secretary of the Broadway Gas Company, in succession to Mr. GILES STEPHENS, who has relinquished the position.

Mr. W. E. ROBERTS, Assistant-Manager of the Woolton Gas Company, has been appointed Manager and Secretary, in succession to the late Mr. Henry Hatch.

In the "JOURNAL" last week, we noticed the appointment of Mr. L. TREWBY as Engineer and Manager of the Mill Hill works of the North Middlesex Gas Company. Mr. Trewby succeeds Mr. C. H. RUTTER, Assoc.M.Inst.C.E., who takes the position of Assistant-Engineer of the Brighton and Hove Gas Company, rendered vacant by the death of Mr. J. Falkner Paddon, notified in our columns a few weeks ago.

Attention is called in a local paper to an interesting incident in connection with the procession to church of the Mayor of Stockton-on-Tees (Alderman George Thompson), on his entering upon the duties of his office on the 10th inst. It was the presence, for the 33rd time without intermission, of Mr. WILLIAM FORD, who has given such valuable service to the town in connection with the gas undertaking.

At the meeting of the Borough Council of Paddington on the 10th inst., Sir JOHN AIRD, Bart., M.P., was presented with his portrait in oils, painted by Mr. S. Paget, on his retirement from the mayoralty. It was subscribed for by the aldermen, councillors, and staff of the borough. Our readers are aware that the firm of which Sir John is the head have been carrying out the great reservoir works on the Nile, which are shortly to be opened with becoming ceremony. Sir John left Charing Cross last Tuesday morning for Egypt.

It has been for some little time known to the personal friends of Dr. HAROLD G. COLMAN, Chemist to the Gas Department of the Birmingham Corporation, that he was about to relinquish this position. We now learn that his resignation has been formally accepted by the Gas Committee, and that his engagement will terminate in March next. Dr. Colman, it may be remembered, is the Examiner in "Gas Manufacture" to the City and Guilds of London Institute; and his intention is to come to London and commence practice as a Consulting Chemist.

The late Mr. E. W. T. RICHMOND left estate of the value of £27,288, of which £24,253 is net personalty. By his will, which is dated Feb. 25, 1900, he bequeaths to his widow £100, the household furniture, &c., all insurance moneys, and, while she remains unmarried, the income from the real estate and the residue of the personal property; but in the event of her marrying again, she will have an annuity of £100. Mr. J. F. Atkins, one of the Executors, is left a legacy of £100. Subject to these bequests, the estate and effects are to be divided among the children in equal shares.

Among the new members recommended for election on the Council of the Royal Society for the year 1903, we notice with pleasure the name of Mr. HAROLD B. DIXON, M.A., Professor of Chemistry and Metallurgy in the Owens College, Manchester. The name of Mr. Dixon will be remembered by most of our readers in connection with the important series of experiments carried out some years ago at the North Foreland, to test the relative values of various illuminants for lighthouse purposes, as well as by his literary productions, many of which have appeared from time to time in our columns. One of the latest of these—a paper on "Movements of the Flame in the Explosion of Gases," read before the Royal Society—was given in the "JOURNAL" for the 1st of July last.

At the meeting of the Marylebone Borough Council last Thursday week, the Mayor (Alderman Elgood) presented, in the name of all the members, to the late Mayor, Mr. E. BOULNOIS, M.P., the Chairman of the West Middlesex Water Company and of the Staines Reservoirs Joint Committee, a pair of silver jardinières, and to Mrs. BOULNOIS an opal and diamond brooch, in appreciation of their services during the past two years. An address, which accompanied the gifts, signed by all the aldermen and councillors, referred to the fact that Mr. Boulnois had "served Marylebone in many capacities for the last forty years, and had established an enviable record of public duty." Mr. Boulnois, suitably acknowledged the presentation. He left England last Tuesday morning with Sir John Aird's party referred to above, for Egypt.

Last Wednesday, Mr. D. E. GARLICK, who is relinquishing the position of Manager of the gas and water works of the Barnoldswick Urban District Council, which he has held for eight years, to take up similar duties at Glastonbury, was the recipient of a leather travelling case, with a gold plate bearing a suitable inscription, from the local officials. The presentation was made by Mr. C. Thornton, the Clerk to the Council, who also presented Mr. Garlick with a neat gold-mounted umbrella, with initials, and two volumes of books on gas matters, which were sent from the gas workers in recognition of the high esteem in which he was held by them. In acknowledging the gifts, Mr. Garlick referred to the good feeling which had always existed between himself and the other officials, and said that wherever he went he should never find a better staff, if he found its equal. Dr. Alderton, the Medical Officer of Health, and several of the other officials spoke, and wished Mr. Garlick success in his new undertaking.

OBITUARY.

The death is announced at the age of 72, of Mr. H. A. ADDIS, Secretary of the Usk Gas Company and Chairman of the Usk District Council.

The death is announced, at the advanced age of 89, of Mr. JOHN DAVENPORT, one of the founders of the Altrincham Gas Company. He was Mayor of the borough as far back as 1855.

Mr. JAMES SHELDRAKE, who represented Messrs. D. Hulett and Co. for upwards of forty years, died last Friday, at Framlingham, at the age of 81. Deceased, who was father of Mr. J. H. Sheldrake, was well known to many gas engineers in the West of England and the Eastern Counties.

We regret to record the death on Friday last, at the Royal Mint, of Sir WILLIAM CHANDLER ROBERTS-AUSTEN, whose name is universally known in connection with metallurgy. Deceased was born in 1843, and entered the Royal School of Mines in 1861, with the object of preparing for the profession of a mining engineer. He, however, became associated with Professor Graham, the Master of the Mint, and succeeded him in the position of Assayer on his death in 1869. In 1882 he was appointed Master. On the retirement of Dr. Percy, he was selected for the Chair of Metallurgy at the Royal School of Mines. He was elected a Fellow of the Royal Society in 1875; and among the posts he held were those of President of the Iron and Steel Institute, Vice-President of the Chemical Society, the Physical Society, and the Society of Arts, and Hon. General Secretary of the British Association. He was made a C.B. in 1888, and was created a K.C.B. in 1899.

NOTES.

Analysis of Natural Gas at Heathfield.

Last month two experts—Professor Harold B. Dixon, M.A., F.R.S., as Chemist, and Professor C. Le Neve Foster, D.Sc., F.R.S., as Geologist—paid an official visit, on behalf of the Royal Coal Commission, to the works of the Natural Gasfields of England, Limited, at Heathfield. Professor Dixon subsequently made an analysis of the gas, which he sent to the Company's Manager (Mr. Inverness Watts); and this has been published in the "Statist." The composition of the gas is given as follows: Methane, 93·4 per cent.; ethane, 3 per cent.; nitrogen, 2·7 per cent.; carbon monoxide, 0·9 per cent. The investigation did not reveal the presence of any free oxygen or olefines. Professor Dixon adds that his analysis differed so markedly from another one which he had been shown, that he had felt bound to repeat the work, and especially to make quite sure there was no free hydrogen present.

The Use of Tar on Road Surfaces.

In a recent number of "Cosmos," reference was made to some experiments carried out in Paris during July and August last, under the supervision of M. Dreyfus, on the road leading from the Porte de Vincennes tramway station to the railway bridge at Champigny, with the view of utilizing tar for laying the dust on the surfaces of public highways. The road was first freed from dust by scraping and careful sweeping, to allow of close contact between the tar and the surface, and then two methods of applying the material were tried; sprinkling from a watering-pot being first experimented with. Alterations were made in the vessel, so as to utilize its entire capacity and at the same time avoid spilling; and a rose was employed of special shape to suit either oil or tar, and fixed at a regulated distance from the ground. A watering-cart was likewise tried; and in this case also the shape and size of the barrel had to be calculated, and means adopted to prevent the tar from spilling. The tar was found to run badly, and it did not spread well at ordinary temperatures. But, on the whole, the appliances worked satisfactorily; the few failures being due to inefficient application of the process and neglect of local circumstances. Of course, up to now, the road has only had rain upon it. It will be interesting to see how it stands frost and

snow. Precautions have to be taken in the use of tar, as with most other materials of the kind; but there appears to be a future for it as a dust preventer.

Preventing the Freezing of Gas-Pipes.

A simple but effective device for preventing the freezing of gas-pipes is described in the "Illustrirte Zeitung für Blechindustrie." It consists merely in the insertion of a wider piece of pipe just where the conduit issues from the ground or wall. For a conduit of a diameter from $\frac{3}{8}$ to $\frac{1}{2}$ inch, a length of from 8 inches to 1 foot of a pipe 1 inch in diameter suffices. The deposition of the water particles contained in the gas, which on leaving the works have a temperature of about 50° Fahr., naturally takes place just where the gas is subjected to the most abrupt change of temperature—*i.e.*, on its issue from the ground. If the external temperature is sufficiently low, the deposited water immediately congeals and clogs the conduit. As soon as the gas has acquired the temperature of the conduit, the deposition of water and congealing cease; and this is said to be the case a short distance beyond the first cooling-point. Therefore there should be no congealing beyond the inserted wider piece, which is wide enough to accommodate a thick ice-crust, and still leave a free passage for the gas. It appears that the principle of this new method is already employed in street lamps, and with success.

Fire-Resisting and Other Paints and Putty.

In the "JOURNAL" a few weeks ago, we gave, from the "Chronique Industrielle," several recipes for white paint suitable for use in factories. We now reproduce, from the same publication, some directions for the preparation of paints and putty capable of resisting fire or very high heat. Soluble glass is a valuable ingredient in paints of this class. A good heat-proof paint may be made with some finely crushed zinc white mixed with a solution of soluble glass (40° to 45° Baumé) until the whole has the consistency of ordinary paint. Before it is applied, the metal on which it is to be used must be cleaned with hydrochloric acid, especially if it is zinc. When several coats have to be given, one should be allowed to dry before the next is put on. Mixed with crushed chalk, soluble glass forms a putty which hardens in six or eight hours. With sulphide of antimony, it gives a dark material which will take a fine polish; and a mixture made with it and iron filings produces a greyish black putty, and with zinc filings a blue-grey putty, which become very hard, and can be employed with zinc. Soluble glass paint, prepared as follows, has been successfully used to render wood fireproof: Zinc white, 1 part; ground spar and soluble glass, each 25 parts. Water should be added until the proper consistency is attained, and the paint can then be applied with a brush. It is well known that some objects have to be kept perfectly white or dull to bring them into relief. They can be maintained in this condition by the occasional application of a mixture of silver white and pure milk, brought to the ordinary consistency of paint. Size paint can be made by mixing finely crushed white with sufficiently liquid size containing a dash of vinegar to prevent putrefaction. It should be applied hot. Size paint can be made salubrious by adding about 2·2 lbs. of boracic acid per 22 gallons; and its application to walls prevents mouldiness. The odour of size can be greatly minimized by the addition of a little bicarbonate of potash to distemper; and if about 3 per cent. of glycerne is put in, the latter will not chip.

Manchester and District Junior Gas Association.—The next meeting of this Association will be held on Saturday. In the afternoon a visit will be paid to the new Municipal School of Technology, Whitworth Street, Manchester, by permission of the Principal (Mr. J. H. Reynolds). In the evening a paper will be read by Mr. S. Tagg, of Birkenhead, on "Efficiency in Gas Manufacture."

Incandescent Gas Lighting for Railway Carriages.—According to the "Revue Industrielle," the Eastern of France Railway Company are the first in that country to experiment with incandescent gas lighting for their carriages. The mantles employed were the "Lumen;" and it is stated that they stood well the effects of a test extending over four months. The average life of the mantle was 105 days, or 1018 hours' illumination for a run of about 30,000 miles.

"Lass's Analysis."—By an announcement which appears in another part of the "JOURNAL," it will be seen that the twenty-second issue of the above-named work is now ready. It may be remembered that in the early editions of the book only the accounts of the Metropolitan Water Companies were dealt with; but in the Analysis as of late years prepared by Messrs. Lass, Wood, and Drew, those of the Corporations of Edinburgh, Glasgow, and Manchester are included. The Water Companies' accounts are for the year ending Dec. 31, 1901, or March 31, 1902; those of the Manchester Corporation, for the twelve months ending at the latter date; and those for Edinburgh and Glasgow, for the financial year to May 15 and May 31 respectively. The compilers have added to the utility of their book by including again a coloured map of the London Water Companies' districts, showing the areas actually supplied and those included within their parliamentary limits.

COMMUNICATED ARTICLES.

DISTRIBUTION PRACTICE IN THE UNITED STATES.

There is probably no more uniformity about distribution work in the United States than there is in Great Britain. It is common experience that, given the same instructions, no two men will do the same piece of work in exactly the same way. Therefore, it is no wonder that gas engineers, who meet together at most several times a year, follow in their work different methods, each for himself. This centrifugal tendency to depart from uniformity in methods and material, needs constant counteracting in the shape of resolutions by Gas Associations to adhere to certain carefully drawn-up standards. In addition to such associated efforts to unify and improve practice, a good deal has been done by the large users of material finding out what is best suited for them, and persuading the manufacturers to furnish it; and, because of large orders, the new class of material becomes the standard, and is furnished to all buyers. The present article describes as well as is possible from any one source of information—and subject to minor corrections for the ideas of individual men—what is considered good distribution practice in the States.

MAINS.

Cast iron has been, and is still, used almost universally. The only large installation of a wrought-iron main system was by the Standard Gaslight Company of New York City, about twenty years ago; and although this experiment of using wrought iron to decrease leakage was always claimed to be satisfactory, yet since the Standard Company have bought out the Consolidated, no more wrought iron has been laid. Great trouble was experienced with the breaking of the cast-iron branches used, due to expansion and contraction of the line; and a large stock of split-branches was purchased, to clamp over these broken ones, in a manner similar to the repair of a broken main by a split-sleeve. Aside from the chance of a shorter life and the much higher cost in all sizes over 4 inches, the great disadvantage of wrought iron compared with cast iron for use in all cities is the weakness of the service connection, due to the thinness of the pipe. If some form of clip or saddle is used for each service, this means—in city work where services may come every ten feet—excessive cost in material and also labour to connect the service, besides more chance of leakage as compared with the usual swing-joint connection to a cast-iron main. The true field for wrought iron (low pressure alone considered) is in small towns or the residential suburbs of a large city; in other words, in any place where the services average 50 feet or further apart, and the probable consumption will never exceed the capacity of a 3-inch or 4-inch main. Under these conditions, a wrought-iron main provided (when laid) with tees for all probable services, furnishes a cheaper, stronger, and better line than could be obtained from cast iron. The soil in such localities is generally very good; and a well-coated wrought-iron pipe will last a very long time, if not indefinitely. Another condition under which wrought-iron mains are sometimes used to advantage, is on a hillside where there is rock, and the opportunity is afforded of laying in a sewer trench, thus saving the cost of blasting. Cast iron would be sure to leak if laid in such insecure foundation as is afforded by a position partway up in a refilled trench; but 4-inch or 6-inch wrought iron is quite strong enough to stand any settling, and the slope of the hillside prevents any serious trapping.

The use of wrought iron for the high-pressure distribution systems recently laid, has been covered by the various articles on these systems, so need not be spoken of here. And for the same reason, no consideration of other features of this high-pressure work will find a place. The pipe used is known as "line pipe"—being exactly the same as that for ordinary work, except that the weights and thicknesses are up to standard, while ordinary pipe sometimes runs 10 per cent. lower than standard. Below I give the standard:—

		3-inch.	4-inch.	6-inch.	8-inch.
Weight per foot . . .	pounds	7·55 ..	10·73 ..	18·77 ..	28·35
Thickness	inches	0·217 ..	0·237 ..	0·280 ..	0·322

These weights are about 25 per cent. heavier than those shown in "Newbigging" for wrought iron. The lengths average 17 to 18 feet for sizes under 2 inches, and about 20 feet for 2 inches and over.

Cast iron is seldom used in sizes below 4 inches; the slight difference in cost as compared with that size being considered as too small a percentage on the total cost of the work to warrant the increased risk of leakage. For the same reason, and also perhaps from a feeling that within a hundred years (easily the life of a 6-inch main) the full capacity of the latter may be needed, very little 4 inch is laid in cities of over half-a-million people. For such cities, the annual mileage laid is, roughly, 10 per cent. or 4 inch; 75 per cent. of 6 inch; and the remaining 15 per cent. of larger sizes. The universal use of 6-inch pipes results in very even pressures throughout the system, and minimizes the number of 8-inch and 12-inch feeders from the trunk mains. The excess

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of cost over 4 inch will not exceed in ordinary years 16 c. a foot; and the consensus of opinion among distribution men is that the 6 inch is more than worth this difference.

To judge from your text-books and technical journals, one great difference between British and American practice lies in the length and sizes of pipes used. Here nothing less than 12-foot lengths would be considered, and only even sizes are ever used —the scale (in inches) running 4, 6, 8, 10 (seldom), 12, 16, 20, 24, 30, 36, 40 (seldom), and 42. Any other sizes would be very special indeed.

The weights are, if anything, rather heavier with you (for American practice see "JOURNAL," Vol. LXXIII., p. 24), also the depth of lead joint. Cement is being used more and more every year; and after proper training, unskilled labour is able to make cement joints which, under air pressure of 3 lbs., test tight with a small percentage of failures. The advantages over lead are saving in time, in material (amounting to 1½ c. per foot on 6-inch pipe), and in leakage. A cement joint once tight will stay so, as the main generally breaks before the joint will. Many lines have been laid for hundreds of feet straight ahead, all with cement joints without any provision for expansion; but, especially in mains over 12-inch, the customary practice is to use lead at least once in about 200 feet.

The making of a cement joint is described in the following answer to the Practical Class of the American Gaslight Association: "Use portland cement. Natural cements are not uniform in quality, and, as a rule, are too quick-setting to permit of their use with safety. In selecting the brand, take a relatively quick-setting portland. If the cement sets too slowly, there is danger of the finished joint being disturbed before setting. Use the cement neat—no sand. Use the cement as dry as possible, so that it requires hammering the yarn against it in order to bring the moisture to the surface. When sufficient water is added, the cement will still appear crumbly in the pan, and will just retain the impression of the fingers when squeezed in the hand. The cement should be used immediately after mixing; if it lies unused over five minutes, it should be discarded. The cement remaining in the pan should be entirely removed before mixing up any new cement. In mixing cement, first determine the quantity required for one joint, and the quantity of water required for this cement, and then always use the cement and water by measurement. Use jute yarn, untarred. When the joint is made, the yarn and sides of the joint may be moist or damp, but should not be wet. Great care should be taken to have the surface of the bell and spigot making up the joint as clean as possible. If there is any appreciable rust, it should be carefully scraped

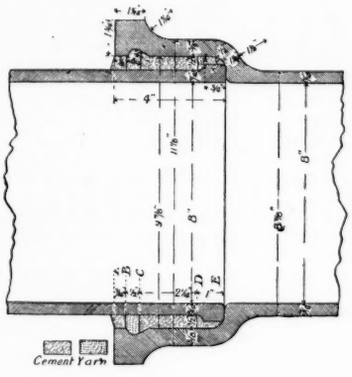


FIG. 1.—CEMENT JOINT.

off with a wire brush; and, if necessary, gasoline should be applied to cut out the rust still further—this being done at least a day before the joint is to be made, in order to give the gasoline time to evaporate. The finished joint should consist of one roll of yarn (fig. 1), of the exact circumference of the pipe, twisted and driven tightly to the bottom of the bell, occupying approximately the space D-E; then a solid mass of cement extending to a point about 1 inch back of the face of the bell, occupying the space C-D; then a second roll of yarn occupying the space B-C; then a facing of cement occupying the space A-B. Do not make a large fillet extending to the outside diameter of the bell. In making the joint after the yarn D-E has been driven in tightly, the cement should be shoved in with the hands, on which are rubber gloves or mitts—preferably the latter—until the whole space A-D is filled as tightly as it is possible to do so with the hands, being particular to fill the space completely. A wooden pusher, shaped something like a yarning tool, is useful for pushing back the cement after it has been put in with the hands. Sometimes a roll of yarn is used to drive the cement back; the yarn being withdrawn, more cement added, and the process repeated until the desired quantity has been entered. The second roll of yarn B-C is then put in and driven back by means of a tool similar to a yarning tool, but with a blunter edge, until it is not possible to drive it back any more, which condition is generally obtained when it has reached the position B-C, as shown in the figure. The space A-B is then filled with cement. The hard driving of the yarn B-C is very important, as being necessary to so compact the cement C-D that there will be no chance for gas to get either through it or between it and the iron. After the first yarn is in, and before the joint is made, the pipe should be thoroughly embedded and tamped in between the bell-holes, to prevent any movement of the joint after it is made. When the joint is made, it should be protected from the sun. As few joints as possible should be made in the rain. If work is done on a hot day, and the pipe has been exposed to the sun so that it has become quite heated, it is advisable to cool it off by the application of water to the inside of the bell and the outside of the spigot; care being exercised not to have any water left in the bottom of the joint, the effect of which will be to make the cement too wet. All joints should be tested before being covered up. The best test is made by connecting gas pressure to the new pipe, through a meter, thus measuring the amount of leakage, if any. If the meter indicates leakage, the holes should be found by using soapsuds on the joints. Fire should never be used. The joints should be tested only after the cement has set sufficiently to prevent its being hurt by the soapsuds; where feasible, this should be on the following day. To make each joint (8 inch), there will be required, on an average, 5 oz. of yarn and 1¼ quarts of cement; and the time required will be fifteen minutes for one man. This time is the average that would be taken per joint over a whole day's work."

The question of temperature is very important; and, in the writer's opinion, if the temperature of the iron when the joint is made is very close to that of the air then, and what the latter will be for the twelve hours after the joint is made, there is very little chance of a leaky joint. Under proper temperature conditions—as a rule best obtainable by making the joint late in the afternoon—joints have been made with comparatively wet cement, indicating that the note as to the dryness of the cement given in the answer to the Practical Class is possibly somewhat overstated.

In theory, a main is best laid when in direct contact with undisturbed earth; but in practice the difficulties of knowing the exact depth for a trench until after portions are too deep, and the lack of skill of the ordinary labourer in bottoming a trench, unite to demand the use of blocking to secure stable support and uniform grade for the pipe. There exists great difference of opinion as to the proper size of the blockings. However, the bottom block is seldom less than 2 inches thick, and for good chance of bearing on the earth ought not to be longer than 12 inches to 18 inches for any sizes up to 12 inch, as most trenches show a curved bottom in cross section, and therefore it is wiser to get any needed area in blocking by increasing its width—viz., the dimension along the length of the pipe. Beside the bottom blocks, there should be distance-pieces of 1-inch stuff, and also wedges; for only by their use will proper adjustment of the pipe be secured. The usual position of the blocking is 3 feet back of each bell; but when two blocks are used per length of pipe—as for large mains, 20 inches and over—the second one is placed 1 foot in front of the bell, and, by means of the wedges, good bearing on both blocks is secured.

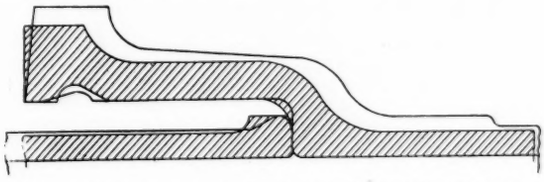


FIG. 2.—COMPARISON OF BELL AND SPIGOT STANDARDS.
[The hatched portion shows the American Gaslight Association standard; the plain portion, the Standard.]

Special castings have improved in design during the last decade. There is an increasing use of all bell varieties, and (in general) the specials carried in stock cover all ordinary cases of pipe work. There are no standards in universal use, though those of the American Gaslight Association are probably finding wider and wider acceptance. Their form of lead ring shown in hatched section in fig. 2, with the long taper of the groove furthest from the face of the bell, is a complete reversal of the form (shown in plain section in the same figure) that hitherto has been in common use. Several sets of experiments, however, conducted by different companies have shown that the new form will keep a lead joint tighter under much more severe deflections than will the old.

In connecting mains to existing mains, where one is 8-inch or smaller and the other is of larger size than 16-inch, it is customary not to cut out the larger main, but to do the work by means of a split sleeve with bell attached, or by a hat flange (see "JOURNAL," Vol. LXXIII., p. 24). The use of line drip-pots is preferred to those known as "side," where the pot is not in the line of main, but connected to it by a wrought-iron pipe. For mains of 30 inches or over—especially in large cities, where, because of obstructions, drip-pots are needed at frequent intervals, and hence there is no possibility of much condensation in any one—side drips are employed, as affording great saving in metal.

More and more the companies are beginning to keep a record (very often on a card) of the amount of condensation, in quarts

or gallons, removed from each drip; and in this way much labour is saved, as the record soon shows that many of the drips do not need pumping at all, and others only at long intervals. A schedule is made out, by which the drips are divided into classes—such as weekly, monthly, quarterly, half-yearly, and yearly. The classification of drips is changed when the records of pumping show the need for such change; and in general by this system of recording the work of the drip-waggon, a handsome saving is effected over the old system of keeping a waggon on drip work every day in the year, without ever ascertaining how many drips were daily found "dry."

Valves are not much used. Where feeders run from large trunk mains, or where the latter cross bridges or large sewers, valves are put to afford quick opportunity for shutting off; but, as a whole, the network of mains is so interconnected that a valve system to shut off any block would be prohibitory in cost, and, as in the case of services, no valve could be depended on unless inspected periodically.

The ordinary extensions to a main system in sizes up to 12-inch are usually tested, under pressure, by applying soapsuds to the joints and carefully examining for bubbles. Where larger trunk mains are laid, and in a big network of small mains where gas is not available, or for any reason a rigid test is advisable, air under varying pressures (say, 3 to 5 lbs.) is employed; and, in addition to examining each joint, a watch is kept on the pressure-gauge, and no appreciable drop in pressure is allowed.

Rubber bags are probably used more extensively than any other means of stopping the flow of gas; but the use of the stopper shown in fig. 3 is on the increase, and, when available (always in

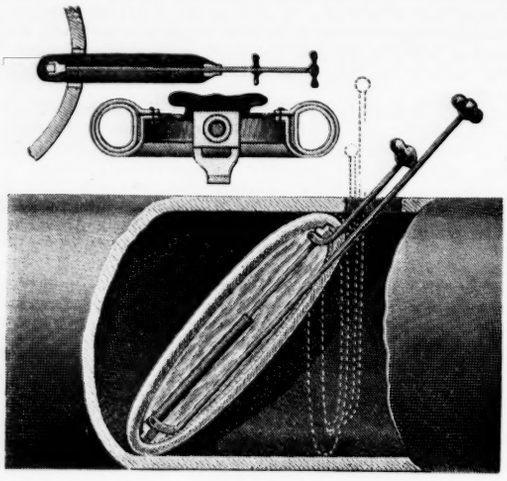


FIG. 3.—THE GOODMAN SAFETY GAS-MAIN STOPPER.

new mains), is safer and more economical than a bag. For small sizes, 8 inches and under, one bag on each side of the opening is safe enough; but above that, two bags on each side are needed.

Mains are usually laid at the same distance from the curb, so that, even without the aid of maps, the workmen will know where to find them. Ordinarily, there is but one main in a street, so, as far as service lengths go, it makes no difference how far from the curb the main is; but a near location (say, 3 feet) is preferred. The question of two *versus* one main in a street, is, as stated above, generally decided in favour of one, on the score of combined main and service costs. Such a decision is justified, for instance, when the house fronts are 50 feet apart, the curbs 26 feet apart, and the widths of houses 16 feet or over. Where there are trolley-tracks to be crossed—especially a double set—it is considered best to lay two mains, unless there are very few buildings on one side of the street.

A location in the roadway is preferred to one in the footway, unless there are two mains in the street and the footway is very wide; the saving in service length then being worth considering. There are also special cases of footway location when the latter is unpaved and where the street is asphalted. The preference for the roadway is due, among other things, to the prevalence of artificial footways, repairs to which cause trouble with householders, as the exact matching in tint of unbroken blocks is impossible, and its imperviousness, as compared with brick or flag, increases the probability of a leak getting into a house. A main 10 to 15 feet away from a house-wall is better located than one half that distance.

Good practice calls for a depth from the top of the paving to the top of the main of 3 feet, and slightly deeper in the extreme northern States, especially for 4-inch mains or under. The extra cost of 3 feet depth as compared with 2 feet is trifling for the advantage gained, which is shared by service as well as main. In fact, in many cases 2 feet deep would be fatal to good service work. The road-roller does not affect the modern main system. Where obstructions enforce shallow depth, there is comfort in the thought that 6-inch specials and pipe do not break easily. The leaks due to broken mains are so uniformly confined to the 2-inch and 3-inch sizes, that many a man can see the practical extinction of these complaints as he replaces the little pipes.

SERVICES.

Wrought iron is universally used, except for the sizes 4-inch and over, which are to be considered in every way as mains. The same objection to the use of 3-inch cast iron—viz., lack of strength—applies for services as for mains. In a congested district, which is most often where very large services are required, the local conditions often make wrought iron preferable to cast iron. The lengths of the pipe vary from 16 to 20 feet, or even 25 feet in sizes 2 inches and over. The weights per foot and thicknesses are as follows: (Sizes over 2-inch have been given under mains).

		¾-inch.	1-inch.	1¼-inch.	1½-inch.	2-inch.
Weight per foot	pounds	1·13 ..	1·67 ..	2·26 ..	2·69 ..	3·67
Thickness . .	inches	0·113 ..	0·134 ..	0·140 ..	0·145 ..	0·154

These weights are lighter, especially the 1½ inch and 2 inch, than shown in "Newbigging" for gas; and yet they are the same as used here for steam. To give an idea of prices, it may be said that 1-inch pipe in quantity varies between 3½ c. and 5 c. a foot.

In cities of over 100,000, good practice prescribes 1¾ inches as the maximum size for house services, and 1 inch for lamp services. The extensive use of asphalte paving in such cities, costing about $3 per square yard to replace, has made it good economy to pay a few more cents per foot for material, adding only perhaps 5 per cent. to the whole cost of the service, but increasing greatly the life and probably the freedom from interrupted supply due to traps or stoppages. A 1¼-inch pipe is far stronger than would be a 1-inch or ¾-inch one, and therefore more capable of resisting strains that might prove disastrous to the latter sizes. What will be the life of these modern services is reserved for the next generation, or may be their children, to solve; but certainly the accumulations of rust and impurities that are daily found in the bends of ¾-inch services would have no effect on the larger opening of the ¾-inch, even supposing that the gas of the present is not better purified than formerly.

In order to relieve the main of any strain brought on by the service, it is quite customary to make a swing-joint connection by

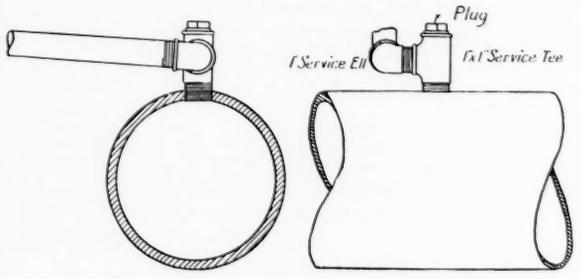


FIG. 4.—STREET MAIN AND SERVICE CONNECTION.

means of a street T and street L, as shown in fig. 4. The use of a street T allows the insertion of a rubber plug to stop the flow of gas while the service is being laid. In general, the practice of screwing the service-pipe into the side of the main, so as to get a straight flow from main to house, is not followed; the hole being usually on the top, with either a swing-joint or a single L. The importance of taking up strain is far greater than of having no bends in the services; for with clean gas and a large pipe, the latter do no harm. It must be understood that naphthalene in the mains and services is almost unknown here. This is due to several causes—to the use of carburetted water gas, either alone or in a large proportion as compared with coal gas, and to the good depth of the mains and services which thus maintain a very equable temperature. Naphthalene shows in the service only where the latter goes through areaways, or projects into cold cellars.

Services are laid at an average depth of 2 feet, and never less than 18 inches, if avoidable. Where mains are shallow, the tap is made in the side with the usual swing-joint.

There is much difference in the use of curb stopcocks. Several large companies put them on all services; the location being oftener in the footway just inside of the curb, than out in the roadway. Probably the majority of the services have no curb-cock, as many companies do not put cocks on 1¼-inch pipe and smaller; and it seems as if the money saved in the cock and necessary stop-box, warrants any risk of gas escape in fires occurring where the lack of a cock prevents prompt shut-off.

The cock used is similar in general appearance to the one shown on p. 249 of "Newbigging's Centenary Handbook;" but it is always made of brass. A composition such as 76 per cent. of copper, 16 per cent. of zinc, 6 per cent. of lead, and 2 per cent. of tin, is considered good; and usually with a flat head—but rarely a square head is found. The disadvantage of the latter—that one is uncertain when the cock is on or off—should prevent its use. A little attention to the proportions of the cock will ensure a head too strong to be twisted off, and an opening in the cock of equal area to the pipe, which does not need to be circular; the rectangular shape causing no appreciable diminution of the

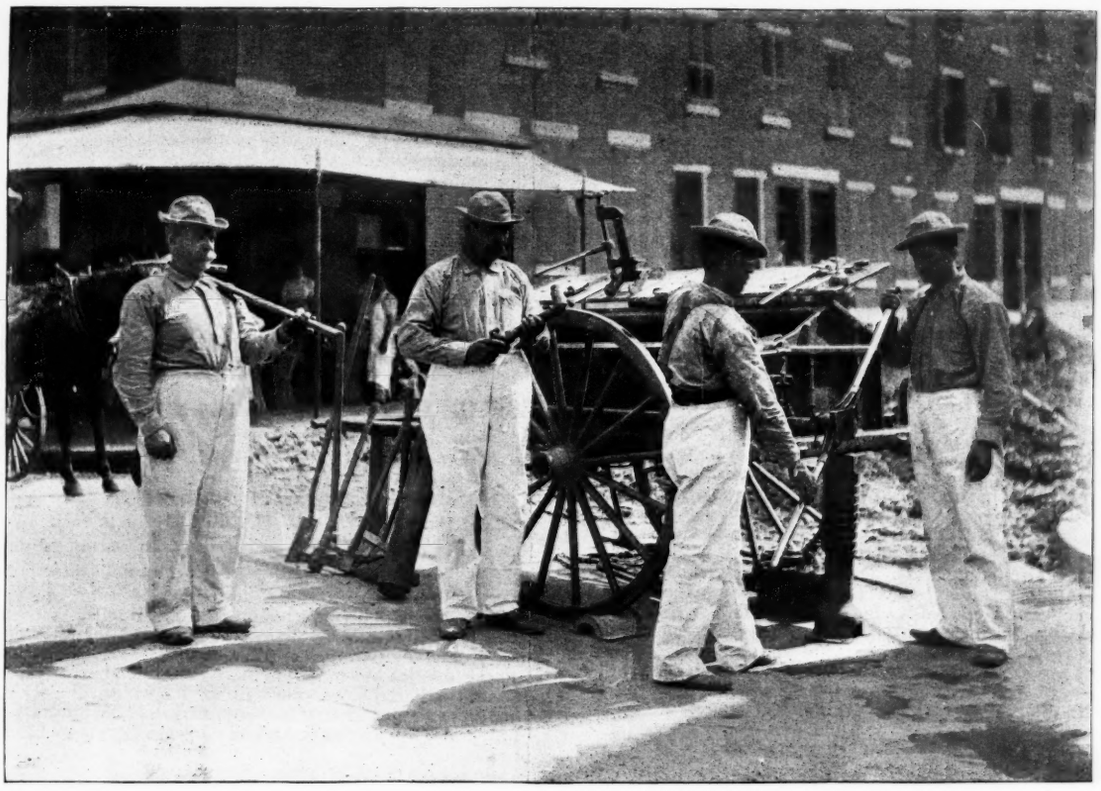


FIG. 5.—AN AMERICAN GAS-WORKS "SERVICE CART."

pressure. A 1¼-inch cock of good weight (say, 3 lbs. 9 ozs.) may be bought for about $1.

If not well made, cocks are very apt to leak around the plugs, and also in the course of time to stick, which is one reason for doubting the wisdom of putting a cock in every service, as quite likely when a quick shut-off is required a stuck cock will defy turning. The only way to ensure easy turning would be periodical inspection; but this cure would be too costly. In order to avoid this sticking, one large company have used valves instead of cocks; and usually valves are employed on all services over 2 inches. These valves are similar in construction to main valves, with the exception of having but one gate.

The stop-boxes for the curb-cocks are of iron, and of two pieces screwing one upon the other, having a range of a foot. Two sizes of these extension boxes usually meet all requirements. One is seen supporting the tail of the service-cart in fig. 5.

The service work is generally done from a cart like that shown in the illustration. This cart contains an assortment of fittings, and all tools necessary, including those for repaving brick and stone roadways, whenever such repaving is done by the service men. No cut pieces of pipe are used except where necessary to place the curb-cock in its proper position. Where the main is on the same side of the street as the house to be supplied, a service ordinarily consists of a cut piece of pipe to the curb-cock, and another cut piece to the inside of the cellar wall—these two pieces being all the pipe used. On services crossing a street, there is generally a length and a cut piece between the main and the curb-cock; and where the house is back from the street, one or more lengths and a cut piece to the inside of the cellar wall. The use of cut pipe to piece out is not considered good practice, because of the unnecessary joints. In this connection, a trial is being made of fittings recessed at the female end, so that the male threads of other fittings or of pipes are completely encased when the fittings are screwed home. In this way, no threads with their lesser cross section as compared with the plain pipe, are left in contact with the earth and influences tending to corrosion; being protected by the recess. The space between the outside of the threads and the inside of the recess is filled by the preservative coating with which the pipe is daubed before screwing up.

STREET-LAMP WORK.

The 1-inch service is enlarged to 1¼-inch pipe from the base of the lamp to about 3 feet above the ground. This is of great efficacy in preventing "won't burns" in cold weather, as before the accumulated frost is sufficient to stop up the 1½-inch pipe the cold weather has passed away. The rest of the lamp-riser is of ¾-inch pipe. A lever-handled cock turned on by the lighter's torch is in general use. The questions of lamp heads and posts, and of incandescent lighting, are too broad to touch here.

METERS.

The dry meter is the only type, and the sizes in general use are 3, 5, 10, 20, 30, 45, 60, 100, 150, 200, 300, and 500 light. The number of 3-lights is decreasing as the use of gas appliances increase. Some companies prefer to use two 300-light meters in place of one 500-light, as the large size of the latter makes them very expensive to move.

Meter connections are now standardized throughout the country—a condition effected by a conference between large users and the meter makers. The evolution of the meter connection is from all lead to all iron. The practice is to make all connections for 20-light meters and over of iron; and there is a growing tendency to extend the use of iron inlet connections to all sizes. There are a few companies who use no lead at all for either inlets or outlets. The substitution of iron for lead tends to economy in first cost of connections, and ensures much longer life; but it makes a change of meters a more difficult operation, and in general demands a better class of workman, to prevent straining, and consequent leaking, of meters. The use of 10 inches of lead in the outlet connections of the smaller meters gives the needed flexibility to the connection to compensate for the poor workman and the shortness of the lead; and the prohibition from bending, except through a slight angle, preserves it from kinks that lead to its end. Where iron is used for inlets, the meter-cock is of the service-cock type, but rather lighter in weight.

No pipe less than 1 inch in size is used in connecting meters to services or house-pipes; any reduction to the size required by the meter connections being made at them. A T is put on the head of the service, and also at the bottom of the house-riser (leading main) for convenience in removing stoppages.

GOVERNORS.

House governors are rare, and not often needed. At the burner, distribution pressures are fairly uniform in the same city throughout the twenty-four hours. A minimum of 2 inches in the mains may be considered standard, and any lower pressures to be increased as fast as possible. There are concerns that for a fixed rental supply and care for mercury governors; but in most cases it is a supposed rather than an actual saving that keeps their customers for them. Many companies stand ready to supply free governors, generally of some diaphragm type, wherever observations show variation of pressure to prevent efficient service from burners or gas appliances.

HOUSE-PIPING.

Instances are increasing where companies make bids for, and instal, house-piping and (more rarely) fixtures. These jobs are almost invariably in old houses, and more often in small towns or cities of the second class, than in the large centres of population, where the number of houses not piped is comparatively few. Where a company do piping, the best practice is to use only galvanized fittings, as they are much less apt to give trouble from sand-holes than plain black. For the same reason galvanized

fittings are at times used on service work. Some companies use no pipe less than ½ inch, claiming that the slight extra cost over ⅜ inch, where the latter would be large enough, is more than offset by the advantage of fewer stock fittings, made possible by not using ⅜-inch pipe.

Complaints.

The rule is to answer all complaints; and though in most cities no responsibility is assumed for work done on piping between the house-riser and the burner, yet advice as to the cause, location of, and remedy for, defective supply, is freely given, and there are some pioneers towards a new order of things who will do anything to give the consumer satisfaction, either free or at slight cost, save only repairs to complicated fixtures.

In looking after complaint work, and also meter work where no piping is necessary, great use is made of bicycles by some companies—one or two meters being easily carried. There is so much asphalte or brick-paving in our large cities that no harm comes to the meter from such carriage.

Gas-Ranges.

Unless the house-piping has been laid with gas-ranges in mind, the current practice is to run a separate supply from the meter to the range, of ¾-inch or 1-inch pipe with a T or so on the line, for future use in connecting heating appliances that might be put into first-floor rooms. The style of range very largely sold, a 16-inch or 18-inch double oven, with four top burners, will burn 70 to 80 cubic feet of gas an hour through all burners; and, in addition, a circulating water-heater is usually installed, consuming about 30 feet per hour. Because gas here is not as low-priced compared to coal as in Great Britain, the fuel sales are not yet as large in proportion to illuminating as there; but the very active methods adopted to instal ranges will overcome the handicap of higher prices. Possibly one family in three in large towns now cooks with gas for at least a portion of the year; this with the cost averaging $1 per 1000 cubic feet.

General Observations.

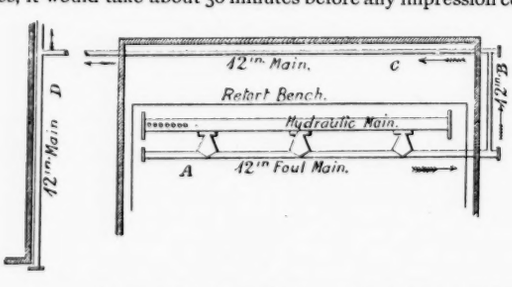
Along the technical lines of distribution, the idea is to look far ahead in providing for future needs, and to increase first cost to lower operating expenses. Along commercial lines, the idea is to find out where each householder stands as to the use of gas, and then to keep for ever after advertising to all non-users or partial users the virtues of gas in all possible ways.

THE NAPHTHALENE TROUBLE.

By Charles Read, of Redhill.

This very stale subject still appears to be worrying the brains of engineers and managers. I have read with interest the papers that have been produced at various meetings, also the discussions that have followed; and I must express my surprise that the subject has been such a difficult one to solve, when, in my opinion, it is simple enough. However, I will give my experience.

When taking the management of the Redhill Gas-Works thirty years ago, the method then employed was to take the gas out of the top, and the tar out of the end of the hydraulic mains; the tar running direct into the tar-well. The gas, with such light tarry matters as it contained, was conveyed to a vertical condenser composed of two rows of 5-inch cast-iron pipes, and thence to a small scrubber for a distance of about 80 feet. This pipe was in the ground. By this process naphthalene was produced in abundance; all the pipes having to be steamed out about four times a year. With 50 lbs. pressure of steam driving direct into these pipes, it would take about 30 minutes before any impression could



be made upon it; and then it would burst forth like a volcano. This state of things I could not allow to continue; so I set about altering the method of condensation, for here lies the secret of all the trouble. My method of procedure will be understood from the accompanying sketch, which shows half of the retort-house and one hydraulic main.

A 12-inch foul main A is fixed behind each hydraulic main, having three openings forming outlets for the gas, tar, &c., which travel together round the 12-inch pipe A, B, C; the other side of the house being the same. After going round the retort-house, these two foul mains join another running along the wall of another retort-house. Having travelled this single pipe for a distance of about 50 feet, the heavy tar is drawn off by a 2-inch pipe (the old vertical condenser being dispensed with); main thermometers being placed in the foul main at various distances. The gas, with such light tar as it may contain, then traverses another 12-inch main, made of wrought-iron, round the purifier-house, all under cover—no part being exposed direct to the sun's rays—for a distance of about 200 feet, and having a gentle back-fall to the point where the heavy tar is drawn off, and forms an excellent condenser.

I feel assured that if engineers and managers would dispense with their vertical pipe and battery condensers, especially where they are exposed direct to the sun's rays, and adopt a horizontal main similar to the one I have described, all their naphthalene troubles would very soon disappear, and peace and contentment reign—a condition of things which the Redhill Gas Company have enjoyed for the past 28 years.

USE OF GAS FOR WARMING ENCLOSED SPACES.

By Thos. Fletcher, F.C.S.

I have been asked to reply to an article in the "American Gaslight Journal" by Dr. W. H. Birchmore, on the above subject. It would be a waste of time and space to traverse and disprove in your "Journal" the whole of his curious statements and "assumed" figures; but the correction of some of the most glaring errors will perhaps be interesting. It must, of course, be borne in mind that the system of heating used in this country is totally different from that in America, and that the close, dry heat, and the absence of ventilation there would not be accepted here. My criticism, therefore, refers in its fullest sense only to the English methods; although as regards actual facts and practice in America, Dr. Birchmore's errors are too glaring to be allowed to pass.

The figures given by him, as a case in practice, refer to a room 16 feet by 12 feet by 8 feet—1536 cubic feet air capacity. According to the English hospital standard, 500 cubic feet space is required for each adult. The room would, therefore, be large enough to be permanently occupied by three persons. The smallest space allowed in English common lodging houses is 240 cubic feet for each; and at this rate the room would accommodate (say) seven persons for sleeping only—to be thoroughly ventilated during the day. The smallest amount of fresh air considered necessary for respiration in English and Continental hospital practice is 500 cubic feet per hour for each adult—*i.e.*, 1500 cubic feet for the three persons. Yet the Doctor "assumes" that 100 cubic feet only will be required. Why he assumes that the recognized healthy standard is fifteen times too large, he does not state. "With a ventilation of 212 cubic feet per hour per head, M. Peclet found a slight odour in a public school of 180 children of the age of 7 or 8 years." (See "Box on Heat," p. 243.) For cleanly and healthy persons, the accepted minimum is 250 cubic feet for respiration, &c., and 60 cubic feet for lighting. These are the quantities proved to be necessary by the greatest authorities, as standards. The fact that Dr. Birchmore "assumes" they are all wrong does not carry much weight; and as his figures are based on this standard, evolved from his imagination, they are of little use.

With regard to heating the air of a room, it may be accepted that 1 cubic foot of gas will heat 825 cubic feet of air 42·5° as stated. This, of course, varies greatly with the composition and heating power of the gas, which in the United Kingdom will vary 30 per cent. or more. But that this air when warmed will retain its heat, is a state of things existing in Dr. Birchmore's imagination only. The loss of heat by walls and windows has never in any experiments I have made, or in the reports of any trustworthy authorities, been less than 75 per cent.; and it varies from this to 87½ per cent. independently of ventilation. The most charming point of all is that he "assumes" a renewal of 125 cubic feet per hour in a room of 1536 cubic feet capacity—*i.e.*, less than once every twelve hours! Now as all the greatest authorities state that 500 cubic feet of fresh air per hour will be necessary for each healthy adult, and that the air in the room, if it is to be kept sweet, must be entirely renewed at least three times each hour, and more frequently if possible in case of sickness, it becomes rather interesting to know the result of the proposed reduction. It would probably be difficult to match even in the foulest and filthiest underground Chinese dens—certainly the most crowded and dirtiest English common lodging house would be Paradise compared to it.

I will leave out the question of the comfort and consequent urgent demand in this country for radiant heat in preference to warmed air, flueless stoves, and other sources of convected heat, which, although very much cheaper than radiant heat, is greatly disliked in this country. It is possible, under the best conditions, to reduce the loss of heat by a flue to 28 per cent. But such economy as this will be very rare; and it may be taken in average English and Continental practice, that the flue loss, where radiant heat is obtained in any large proportion, will be quite 50 per cent. Taking this, the "assumed" 100 cubic feet for ventilation being at least fifteen times as great, and the actual loss by walls and

windows being at least 75 per cent. of the whole, Dr. Birchmore's "assumed" figures require a little correction.

It would appear that he has actually obtained the results stated in practice, and that by some wonderful method he has done away with loss of heat through walls, &c., opening doors, and the many other ways in which heat disappears. This opens up a new vista, and a source of heat hitherto neglected which should render all fires and stoves unnecessary. It has been found that 284 units of heat are generated per head per hour; and this heat must be dissipated to keep the body in health. It would occupy too great a space to go through the calculations, and trace the authorities; but those interested will be able to do so by reference to "Box on Heat," p. 243. As the average heating power of our local gas is given as 720 units per cubic foot, it will only be necessary for three persons to remain in the room to make it too hot for comfort. This being the case, as proved (?) by Dr. Birchmore, no other heating apparatus will be required, and his wonderful stove, which will probably be brought out with a great flourish, and offered for sale, is proved by his own figures to be totally unnecessary—every person being his own stove and warming apparatus, with a decided margin of power to spare. All this great discoverer needs now is to invent a method of utilizing this spare heat for lighting; and we should then be both warmed and lighted by our own natural forces. Evidently the resources of Nature are limitless, and the dreams of the most sanguine fade into insignificance before this, the greatest discovery the world has known. If he will perfect this, I shall only be too pleased to negotiate with him for the English patent rights.

A REAL DANGER.

By Norton H. Humphrys, Assoc.M.Inst.C.E., F.C.S.

The Brighton case, the judgment in which will be found in another column, reveals a serious risk and real danger incurred by all gas companies who undertake the letting of gas-stoves on hire and the fixing of the same on easy terms. This distinction in these go-ahead days is fairly comprehensive, and includes a large majority. The first few periods of warm weather in the spring and early summer, and the first snaps of cold in the autumn and early winter, are characterized by a sudden influx of business—in the first case for gas cookers, and in the second case for heaters. This is well illustrated by the sudden fall of temperature experienced within the last few days, which has led to a demand for gas stoves and fires. With regard to this class of apparatus, the consumer does not order it before he feels the need; and when he does so, he is impatient and anxious to have it fixed at once.

In ninety-nine cases out of a hundred, the fitter who is sent to fix the stove is not the man who originally laid the pipes in the house; and he knows nothing of their general arrangement, even if he has visited the house before. He is expected by his employers to do the work in a reasonable time. They take care that the number of cats is proportioned to the mice to be caught, and for their own sakes they see that he is fully occupied. The customer on his part is anxious to get the job done promptly, as no one likes to have workmen about the house. It is questionable whether either party would appreciate the scruples of a highly conscientious workman who, with a wholesome dread of the possible consequences of neglect—the average workman, by the way, is not much troubled by qualms of this sort—insisted on carefully testing the system of pipes at each house where he fixed a stove, and in making an examination that might occupy some hours, and involve considerable disturbance of furniture, taking up of floor covering, &c. As a rule, the man simply fixes the stove, and comes away in ignorance of whether the system of fittings is sound or not. If no complaint is made, he infers that it is so.

I do not for a moment deny that if a gas-fitter is shown an open pipe plugged temporarily with a chip of wood, and instructed to make it properly secure and gas-tight, but through oversight or for want of time goes away and leaves it untouched, he is to some extent guilty of negligence; but I do ask this question: Why should wood plugs be used at all? It should be a fixed rule, when piping a house, to see that all openings are securely capped or plugged with proper brass or iron fittings before the job is left. It is no more trouble or labour to fix a cap or plug than to cut out and drive in a wedge of wood. Further, the use of loose plugs leads one to infer that the system of pipes has never been tested for soundness.

In the Brighton case, a misplaced nail, driven into the pipe, might have been the cause of similar unfortunate circumstances. The wood plug in all its forms, whether an irregularly shaped chip roughly stuck into the end of a piece of ¾-inch pipe, or a carefully turned stopper for the end of a 6-inch main pipe, intended to remain for five days, but often forgotten and left for as many years, is a source of risk and danger, and as such should be discarded and abolished. Whether it is for the time being made gas-tight or not is a trifling matter, seeing that in one way or another it has been the source of quite enough mischief to warrant its suppression. Many large "unaccounted-for gas" items can be traced to the use of the temporary stopper. The man who forgets to remove the stopper and substitute the proper fitting may be legally responsible for the damage, and perhaps rightly so; but the man who is the active cause of the accident is the one who first left the pipe in an unsound condition.

The lesson to be learnt from the Brighton case is, that all gas engineers should discountenance the use of temporary plugs for unused openings in gas-pipes, and that all such openings should be left properly capped or plugged. And some of those gentlemen who are so anxious to protect the gas consumer from carbonic oxide risks, would find there is more common sense and business in a regulation prohibiting the use of loose or temporary plugs for unused openings than in limitations relating to the percentage of carbonic oxide that might or might not be safely allowed to be present in the gas.

The case also emphasizes the need of some accurate and reliable means of testing a system of gas-pipes for soundness, and that should not only indicate the extent of the leakage, but assist in locating it. One of the witnesses called was a plumber and gasfitter of 25 years' standing, who had been a teacher of plumbing at a Technical School, and was therefore presumably well up in this matter. But his views on the question of testing for leakages are not specially clear and precise, and as a rule the workman is left to blow down the pipe, or make such other rough-and-ready test as his ingenuity may devise. The great demand for gas-stoves increases the length and the diameter of the distributing pipes about a house, and calls for considerably more care in regard to soundness. Another point that should not be overlooked is the fact that, for a similar reason, many companies have found it necessary to increase the supply pressure. A gas company may possibly introduce water gas. They may at or about the same time increase the supply pressure. If an increase in the number of casualties follows, the result is at once ascribed to carbonic oxide. But the increased pressure may be more concerned in the matter than any change in composition of the gas.

TECHNICAL RECORD.

VAGRANT ELECTRIC CURRENTS.

Report of a Committee of the German Association of Gas Engineers.

The Committee appointed by the German Association of Gas and Water Engineers to determine what measures ought to be adopted for the protection of gas and water pipes against the action of vagrant electric tramway currents presented a report at the annual meeting of the Association. This report, recently published in the "Journal für Gasbeleuchtung," sets forth that the Committee had failed in an endeavour to formulate a code of protective measures jointly with representatives of the electrical industry, because the propositions acceptable to the latter did not appear to secure the necessary protection of the gas and water mains of towns. Looked at broadly, the interests of the industries should be the same, as any damage done to the gas or water pipes must fall finally on the owners of the electric tramways. But this broad view is often cast into the background by the interests of the immediate future. Tramways, whether belonging to municipalities or to private companies, are often sources of very considerable income, which might be injuriously affected by regulations for the protection of gas or water pipes. It is therefore easy to understand that these interests would naturally be difficult to combat.

The Committee report, therefore, that they have formed the opinion that the better way is for them to act independently of the Committee of German electricians, and first of all, at least, to make no attempts to work jointly with that body. Endeavours should be made afterwards to bring about an understanding, as soon as it has been clearly ascertained what requirements would meet the case. The difficulty in the matter has, however, been the absence of any reliable facts or data. The full extent of the destruction caused is not known. Cases are extant from America and from Hamburg and other large towns in Germany, and also from England. But nothing definite has been made known; and it is impossible to say that this or that difference in tension, &c., is admissible and harmless, and that if that limit were maintained damage would not occur. This was perhaps also the reason why the electricians were as yet afraid of establishing definite protective regulations. The Committee would in the near future, endeavour to determine, by means of questions addressed to the authorities of the gas and water works in large towns, what damage had arisen from vagrant currents, and would then institute experiments on the actual conditions prevailing in respect of difference in tension between the mains and the earth, or between the return conductors and the rails of the tramways, as well as the damage to water and gas mains observed in different kinds of soil. They would then be able to judge what regulations were necessary to afford the minimum permissible degree of protection. From these questions and experiments, the Committee would proceed to tests on a larger scale at suitable places.

The Committee hoped by next year at least to have some facts to publish to prove that a step forward had been taken towards clearing up the question of the protection of water and gas mains from earth currents.

SUCTION PRODUCERS FOR GAS-ENGINES.

There have been many communications in the Technical Press lately on the construction and advantages of plant for making producer or generator gas without the aid of a boiler. As a serviceable plant of this type would tend to extend very greatly the use of gas-engines, we give below an abstract-translation of an exhaustive paper on the subject by Herr J. Körting, of Hanover, and published in the "Journal für Gasbeleuchtung."

Generator or Siemens gas has for a long time attracted the attention of engineers engaged in constructing or working gas-motors, because it enables the motors to be used independent of gas-works. In 1877, the author's cousin, Ernst Körting, made experiments on a gas-engine with gas produced in a small generator. Gas-engine makers next turned their attention to building engines for supplying motive power for trade purposes in towns, using the ordinary coal-gas supply. Small power only was asked for at first; but in time the duties required from the engines increased, and larger ones came into use. This caused attention to be again turned to the employment of cheaper gas, independent of the gas-works. In the middle of the eighties, Mr. E. Dowson brought out his apparatus of this kind—viz., a gas-engine with a small generator of its own. This gave an impulse to the development of the generator or power gas plant of to-day. According to his well-known process, Mr. Dowson added water to the air used for gasification, because he rightly thought that he could obtain a better result by this means.

It is interesting to notice the difference which ensues according as dry or damp air is supplied to a generator. The first fundamental experiments on this point were carried out by Dr. H. Bunte, in 1878; and the results were embodied in a series of detailed reports entitled "Experiments on the Productive Capacity of Coke Generators under Varying Conditions of Draught," published in the years 1878 and 1879. Herr F. Fischer, in 1879 and 1883, found from experiments with a Klönne coke producer that when dry air was supplied, the producer worked with an efficiency of 69 per cent., and with an efficiency of 82 per cent. when steam was added to the air for gasification. The influence of steam is best seen from a comparison of the analyses of the gas before and after using steam:—

	Before. Per Cent.		After. Per Cent.
Carbonic acid	2·0	..	6·9
Carbonic oxide	29·4	..	26·0
Methane	trace	..	0·4
Hydrogen	1·9	..	14 0
Nitrogen	66·7	..	52·8

The net calorific value of the first sample was 26½ calories, or 105½ B.T.U., and of the second 34 calories, or 135 B.T.U., per cubic foot.

The percentage of carbonic oxide decreases and that of carbonic acid increases, because a certain quantity of heat is required to decompose the water. The percentage of hydrogen rises considerably; thus increasing the heating value of the gas. The percentage of nitrogen falls, in consequence of the large quantity of oxygen from the decomposed water which passes into the gas, and decreases the air with its nitrogen, needed for gasification. This also shows an enrichment of the gas. There is further the not unimportant advantage that the gas is cooler as it passes from the producer, which is thereby well preserved. In those works where the heat of the gas is not utilized, the loss due to its cooling is less.

The modern power-gas plant has been still further perfected, as will be explained in the description of the Körting plant which follows. The generator consists of a cylindrical furnace chamber, with iron shell, and having a doubly-sealed and water-cooled lid. The gas produced passes first through an air-heater and then through a water-cooler, from which the water for feeding the boiler is taken. It next passes through a coke scrubber, and in most cases also through a sawdust purifier. The latter would not be necessary, if clean fuel only were used; but German anthracite and coke have to be dealt with as well as English anthracite, and therefore further purification has to be provided. Very often power-gas plant is furnished with very faulty purifying arrangements in order to admit of its being sold at a low price. But if the gas passing into the motors is dirty, the latter are soon injured, working is interrupted, and the use of gas-engines is brought into discredit.

The gas passes from the sawdust purifier into a gasholder, which, however, is only for regulating, and not for storage purposes. The size of the holder is adapted to the work of the gas-engines, so that the output of the generators may be given time to follow changes in the demand. The steam required for the blast is produced by a special small boiler. The bell of the regulating gasholder is connected with the steam supply for the blast, and thus the consumption of the gas-engine controls the quantity of gas produced. The gas is under a certain pressure, and at any moment its quality can be checked by means of a test flame. It may be mentioned that the gas burns, like water gas, with a blue flame, tinged somewhat with green or orange. In researches made by Herr Fischer, on similar power-gas plants, in which, however, no pre-heating of the air for combustion took place, the average analysis of the gas was found to be—

	Per Cent.
Carbonic acid	7·2
Carbonic oxide	26·8
Methane	0·6
Hydrogen	18·4
Nitrogen	47·0

This satisfactory utilization of the fuel can be increased by heating the air. It was ascertained in practice that this gave an increase of 8·8 per cent., or in round numbers 9 per cent. The loss from the boiler in small works, or where defective or too small boilers are used, may be of importance. In some works, 25 per cent., or even more, of the fuel had to be used under the boiler. In the apparatus at the Körting works, however, the boiler fuel was ascertained, by careful observation, to amount to 9 per cent. But this apparatus had the air-heating arrangement, which compensated for the loss from the boiler; so that it worked with the best possible efficiency.

Apart from the unsatisfactory consumption of fuel with a small plant, the steam-boiler presents a number of other inconveniences. In Prussia, for instance, where power-gas plant requires no permit from the authorities, doing away with the boiler gives complete freedom from State inspection and from the obligations incurred with boilers, such as the constant presence of an experienced stoker. But giving up the boiler entails the loss of the convenient steam-blast beneath the grate, and of simplicity in starting work when the boiler is in operation, as well as the certainty of a sufficient supply of steam to the generator.

Apparatus without boilers was constructed in the middle of the nineties by M. Lencauchez, of Paris, who erected large power-gas plants at various industrial works near that city. The necessary air for gasification was forced through the grate of the generators by means of a fan. It was M. Bénier, of Paris, who first drew attention to the possibility of using the suction power of the motor for drawing out the gas, and thus dispensing with any auxiliary for driving the air for gas-making under the generator. Somewhat later, Messrs. Körting Bros. obtained a patent for applying the suction power of the motor for this purpose.

These so-called suction generator or producer gas plants have been much talked about recently. Of course, such apparatus cannot dispense with the addition of aqueous vapour to the air for gasification. Lencauchez sprinkled water under the grate of the generator. In more recent suction gas apparatus, the heat of the gas produced is used for producing the steam required. There is therefore in these plants an open steam producer. The pre-heating of the air and the advantages derived from it are, however, wanting. It must be ascertained whether the amount of steam which the heat of the gas can produce is sufficient. Assuming that the gas is taken off at 450° C. (840° Fahr.), and cooled to 150° C. (300° Fahr.) by the evaporating arrangement, then a cubic foot of gas affords 10·1 B.T.U. From 1 lb. of pure carbon, 86·5 cubic feet of gas are obtained; and this volume would therefore afford 874 B.T.U., which would produce 0·75 lb. of steam. Now, since 0·75 lb. of water is required in order to exhaust the power which 1 lb. of carbon possesses of decomposing water, and yet provide no excess of water, it follows that theoretically the amount of steam obtained would suffice. But, in reality, on account of the inevitable losses, especially by radiation, this result will not be actually obtained. The result of a smaller water supply is that the temperature of the gas taken off is raised, and therefore freer evaporation ensues. Consequently, evaporation afterwards takes place according to requirements. But, on the whole, a gas of less heating value will be obtained, and the generators, even with the best evaporators, will gradually get warmer.

In apparatus without a boiler, the use of a blast cannot be entirely avoided. Where the engines themselves are used for the suction of the gas, an air-blast under the grate is absolutely necessary for starting the apparatus and for raising to incandescence the deep bed of fuel in the generator. This blast entails motive power. In apparatus with a boiler, the power was furnished by the steam from the latter. In the suction type of apparatus, however, other motive power had to be provided; and in many cases it is electricity or hydraulic power. Where neither of these has been provided, hand power has now and then been used, but, of course, only with small apparatus, and even then it would usually be inconvenient. The blast lasts from half-an-hour to an hour if the generator has not been at work, but after an interruption only of work, a quarter or half an hour is sufficient. After this the gas can be used for the engines. The valve is then opened and the gas-engine started. It will then automatically suck the gas through from the generator. The production of gas is self-regulated according to the requirements; and therefore in small apparatus governors are frequently omitted.

A suction gas plant of this kind has been erected by the firm of Julius Pintsch, at Heusy, in Belgium, for driving 75-horse power gas-engines. The apparatus consists of a generator with a charging-shoot, by which it can be charged with the fuel requisite for a long period. Next to the generator is an evaporator, and then follow scrubber, atmospheric condenser, and purifier—all of ample dimensions. After these there is a special regulator, so that the motor does not suck directly on the purifiers, and does not therefore meet with the great resistance which they would offer to the suction.

These suction gas plants are exploited as something special, and stress is laid on the point that, unlike the ordinary power gas apparatus with boiler, no gasholder is required. It may therefore be again expressly stated that no difference in principle exists between the two kinds of power gas apparatus, and that pressure gas apparatus needs a gasholder no more than suction gas apparatus. A certain regulating space is always advisable, so that the generator can adapt itself better to the changes in the quantity of gas taken off.

The evaporator delivers steam under the grate of the generator, which can be opened from time to time for cleaning purposes. This is not possible with plant in which air is supplied under pressure to the grate, and more especially when there is a boiler, as the gas production would be interrupted by the opening. The possibility of opening the ashpit of the generator while working is therefore an advantage of the suction gas apparatus, provided the clinker only collects on the grate, and can therefore be removed while the plant is in operation. If, however, as is the case with many fuels, clinker also sticks to the side walls, it must be removed during stoppages. When there is a boiler with the apparatus, it generally suffices if the clinkers are removed from the generator at the midday and evening intervals which are observed at almost every works.

In suction gas apparatus, the gas from the generator up to the engine is at a certain negative pressure; therefore no gas can escape, as with pressure gas apparatus. Air can, however, pass in through careless working and by leakage. This entry of air might cause deterioration of the gas, or even some danger in case an explosive mixture were formed. In the suction gas apparatus also the quality of the gas cannot be ascertained while the engine is at work by so simple a means as the test flame in pressure gas apparatus. It must depend upon circumstances, such as the accumulation of clinker in the generator, whether a good gas is produced. Consequently, with pressure gas apparatus without a charging-shoot, the layer of fuel is raised as the clinker accumulates. The plant at Heusy was designed for coke, and large-sized metallurgical coke is gasified in it.

For the gasification of anthracite, the sawdust purifiers are often omitted, and the plant then assumes the typical form of small suction gas apparatus, consisting only of a generator, evaporator, and coke scrubber. Between the latter and the engine there is an empty vessel in place of the regulator, otherwise the engine sucks direct from the scrubber. The arrangement of an apparatus of this kind, as carried out by Messrs. Körting, is seen from the accompanying illustration (fig. 1). The various forms differ considerably; for example, the Deutz Engineering Works put the evaporator in the upper part of the generator, where it is combined with the charging-shoot. The small scrubbers are very remarkable in this type of apparatus, and are undoubtedly insufficient to effect proper purification of the gas. In general, apparatus of this kind can only be used with the very best fuel, such as English anthracite in large pieces. The generators are usually provided with a charging-shoot. The gas-engine takes its gas at a certain negative pressure, which varies according as the engine is using much or little gas; for when only a small quantity is drawn off, the resistance is naturally feebler. The pressure of the air is, however, constant. Therefore to obtain the correct mixture, with changes in the working, there must be some mode of governing the air supply. Actually, the senses are relied upon to tell if the engine gives regular ignition, and nothing more is done. The attendants acquire great skill; but the procedure is a rough-and-ready one. It is not practically feasible to ascertain from an indicator diagram whether the combustion is good. Efforts should undoubtedly be made to construct the engines so that after they are started, no further attention to the gas and air supply shall be necessary. This is requiring no more from a gas-engine than what is taken for granted with a steam-engine. Most gas-engines still have no such arrangement, though the author's firm provide their engines with a mixing-valve which ensures exact admixture. But with such engines it is a fundamental condition that gas and air must be supplied with the ratio between their tensions almost constant, which ratio is secured each time the engine takes its charge. This is done most readily when the gas is at a positive pressure, which, by a simple regulating arrangement, is kept constant and quite low. A special contrivance would have to be fitted to suction gas apparatus to attain the same end.

As the gas made in suction gas apparatus cannot be conveyed very far, as moreover it cannot be used for heating or other technical purposes, and as leaks and unintentional ingress of air might do great damage, the plan of keeping up the blast

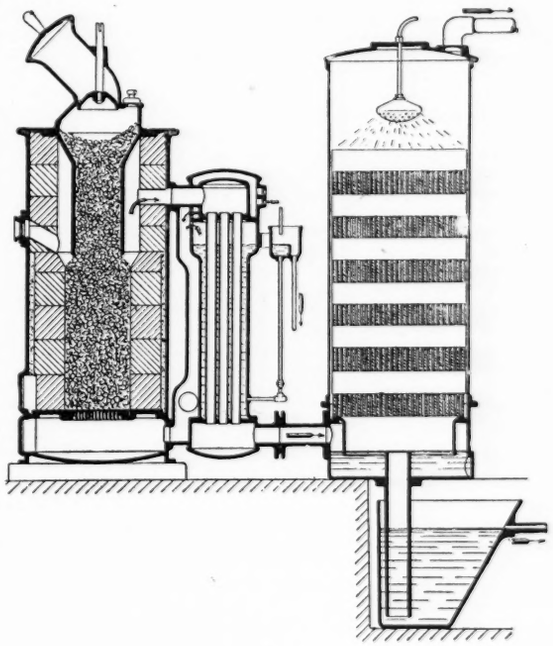


Fig. 1.

also while the engine is at work is often resorted to. This is a return to the above-mentioned process of Lencauchez. In fig. 2 is shown a Körting plant of this kind. The fan requires very little power—*e.g.*, with a 100-horse power engine it will require about ¼-horse power. The fan forces air, which has taken up steam from the evaporator, under the grate of the generator. This arrangement has the advantage that in a large plant consisting of several generators they can be connected and brought into action one by one with the greatest ease, as soon as good gas is being made in them, and the system of purifiers has been blown out with the help of the fan. Thus any air and bad gas present are driven out before the gas joins that from the other generators already in action.

A generator cannot be connected up for work so simply with pure suction gas plants as with this process. Of course, by

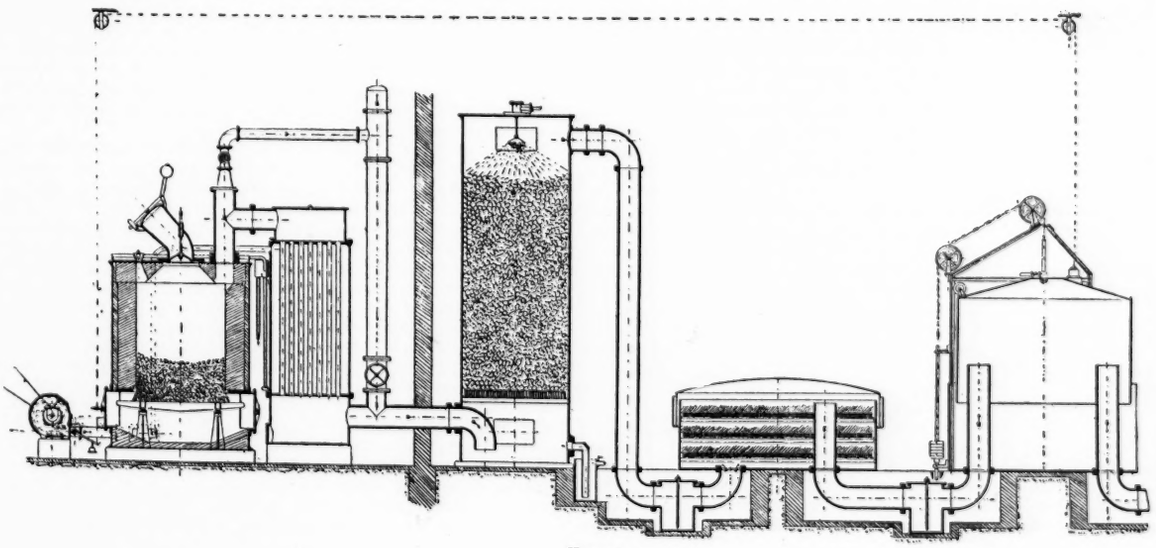


Fig. 2.

retaining the plan of working with a fan, the possibility of removing clinker during working is lost; but, as already pointed out, the intervals between work in most cases suffice for clinkering. Where that is not the case, the fan can also be arranged so that it sucks the gas produced in the generator through the purifying apparatus, &c. Pressure gas is always obtained in one part of the plant, so that the quality of the gas can be ascertained by a test flame.

These plants, in common with those worked by a boiler, have the advantage that fuel of smaller size can be more readily consumed, because it is possible to overcome greater resistance in the plant. This is naturally a valuable gain, as small fuel is much cheaper. For example, English anthracite of a size of ½ in. by ⅜ in. can be bought to-day at a lower price than the best German anthracite, and it is generally one-third to one-half cheaper than large-sized English anthracite, which is the most favoured fuel for simple suction gas plants, with a view to avoiding interruptions. Likewise German small anthracite is much cheaper than large. In these plants also comparatively worthless coke can be more satisfactorily used.

There are not as yet any figures available, from actual practice, on the efficiency of suction gas plant. Up to the present, any published have been even more unfavourable than a series referring to installations with boilers. The figures have, however, been given inclusive of the duty of the gas-engines; and as modern gas-engines differ considerably in efficiency, the degree of perfection of power gas plants cannot be judged from these figures only. Further practical working results must therefore be awaited.

With small apparatus, a trifle more or less in the consumption of fuel is of no importance. The omission of the boiler appears to have wrought a change, inasmuch as works which for a long time have used illuminating gas exclusively have now turned their attention to power-gas plants. Gas-engine owners find illuminating gas the most convenient because the erection of a power-gas installation is attended with expense; and certain troubles are unavoidable. If, therefore, the working expenses with illuminating gas were only slightly greater than those for power-gas plants, the owners of such plants would willingly continue to use illuminating gas, because of its convenience. If, however, the difference is great, the introduction of power gas is furthered, and the use of illuminating gas for driving gas-engines in towns becomes jeopardized. The risk is specially enhanced in places where, as in Berlin, the price of illuminating gas for use in gas-engines has been raised. In that city power-gas plants have now attracted the attention of large as well as small owners; and important engineering works in the business centres have begun to discontinue the use of illuminating gas in order to employ power gas. This change has been hastened by the fact that with new installations, properly carried out, all annoyance to the neighbourhood is avoided.

It will be seen that reference is made by Herr Körting to certain types of suction gas-producers, which were being advocated because they dispensed with gasholder and boiler, and thus greatly reduced the cost of the plant required for generating power gas for feeding a gas-engine. The best known plant of this type has been fully described in a paper read some months ago, by Herr H. Gerdes, Chief Engineer to the well-known firm of Julius Pintsch, of Berlin, before the Association of German Mechanical Engineers. The plant is being introduced into this country by Mr. Julius Moeller, formerly General Manager of the Welsbach Incandescent Gas Light Company; and as it has some distinctive features of interest, we give below some particulars taken from Herr Gerdes' paper.

Attention is drawn first to Messrs. Pintch's successful attempt at Fürstenwalde-on-the-Spree to utilize the "blow" products of a water-gas plant in gas-engines. These products (essentially producer gas) were collected in a gasholder of 10,500 cubic feet capacity, from which two—and afterwards three—gas-engines sucked the requisite gas for the charges. It was found necessary to introduce a bell governor in the pipe leading from the gasholder to the engines, in order to overcome fluctuations of pressure due to the engines not running uniformly together. The interposition of large cushioning chambers had proved ineffective in meeting this difficulty. The water gas was needed for welding and similar uses; so that in this case the producer gas utilized in the engines was an unavoidable bye-product, which had previously been wasted. The ordinary power gas made by Dowson and similar gas plants is essentially a mixture of water gas and producer gas, and is often termed semi-water gas. This gas has a calorific power of about 135 B.T.U. per cubic foot. But steam is required to operate such a gas plant, and hence a boiler installation has hitherto been a necessary accessory. The fuel account must therefore include, as with water gas plants, both generator and boiler fuel.

It is essential that the gas used in gas-engines should be free from dust; and in this respect many power-gas installations are defective. In order to avoid as far as possible the production of dusty gas, and the necessity for frequent clinkering, anthracite is commonly used in power-gas producers instead of coke. After preliminary trials, Messrs. Pintsch erected at Heusy, a suburb of Verviers, in Belgium, a gas-power plant, in which the gas-engine drew in the air and steam required for operating the producer, and pulled the gas through the condensing and cleansing apparatus. The boiler and gasholder were dispensed with in this plant, which has been in operation since January, 1901.

The entire installation is under vacuum; hence the producer doors may be opened for clinkering at any time. A bell governor maintains uniform pressure in the gas-main, whatever the period of the cycle of the gas-engine; and therefore the production of gas is constant and uniform. The gas is freed from dust by means of a special purifier. A special rotary air-lock enables the generator to be re-charged during work without inflow of air. The working results at Heusy have shown a consumption of 1·41 lbs. of inferior coke (containing over 20 per cent. of water and ash) per brake horse-power; but there was considerable room for improvement in both the proportion of steam to air admitted to the producer—and in the working of the gas-engines, of which the compression was insufficient to give the best results. When these conditions have been improved, 1·1 lbs. of dry coke per brake horse-power should suffice. A fan is required to start working; but once the plant is put in operation, occasional recharging is said to be virtually the only attention required. The steam required is generated by means of the heat carried off by the gas from the producer.

It is claimed that the suction gas plant, as made by Messrs. Pintsch, possesses several advantages over ordinary power-gas plant and over earlier suction-gas processes. Among these may be named the abolition of gasholder and boiler, with consequent saving in cost of erection, fuel consumption, attention, and supervision, the maintenance of uniform pressure by means of a governor, adaptability for the consumption of coke in place of anthracite, avoidance of escapes of gas, uniformity in composition of gas, and satisfactory purification of the gas from dust.

The reading of Herr Gerdes' paper was followed by a lengthy discussion between Herr J. Körting and the author, which need not be quoted here, as Herr Körting's views on suction gas-plant have been sufficiently indicated in the translation of his own paper given above.

EXTRACTION OF NAPHTHALENE BY OIL-WASHERS IN AUSTRIA.

Naphthalene washers have been recently introduced by the firm of F. Manoschek, of Vienna. The naphthalene is absorbed by washing the gas with anthracene oil saturated with benzol, as has been done for some time past in this country; but washers of special type have been introduced for the purpose by the Austrian firm. The consumption of anthracene oil, which is supplied by the dealers in tar products, amounts, according to "Der Gastechniker," to about 1 lb. per 1000 cubic feet of gas dealt with. The washing oil, when saturated with naphthalene, is run out from the washers, and mixed with the tar. It is therefore again disposed of at the price of tar, so that the cost of the process is said to be low. It should also be taken into account that the work, trouble, and annoyance occasioned by the naphthalene deposits no longer occur. In order to prevent deposits of naphthalene in the apparatus and connections on the gas-works, and also because the absorption of naphthalene takes place more readily with warm than with cold gas, the naphthalene washer should, if possible, be inserted in the train of apparatus before, or at the latest immediately after, the scrubbers.

The naphthalene washers are constructed of different sizes to suit small or medium-sized works, and to work either with or without exhausters. The washers for capacities up to a make of 175,000 cubic feet of gas, are built with one chamber; but larger ones have two chambers. The washing chamber is equipped with a series of sloping laths, disposed as in Venetian blinds; and these distribute the gas in thin layers, thereby ensuring thorough washing, and a complete extraction of the naphthalene. The gas passes through in the opposite direction to the washing oil; so that that which is richer in naphthalene meets the more fully saturated washing oil, and *vice versâ*.

The apparatus comprises a wrought-iron shell, which is extended downwards to form a collecting chamber, in which the oil, which has passed through the washer, collects, until it is pumped into a reservoir above for use again, or, if completely saturated, until it is run off through a pipe into the tar main or well. The fresh oil is brought into the collecting chamber, either by direct connection with the oil cask or by means of a pump. The filling of the collecting chamber is continued until the oil begins to run out at an overflow tap fixed at the side. A tap is also fitted lower down for taking samples of the saturated oil. The reservoir at the top of the washer is provided, in order to ensure that the outflow of oil is uniform, with a float which revolves and sinks lower into the liquid as the oil runs out. The space which had been occupied by oil is filled up by the float, so that the level of the oil remains unaltered, and the flow of oil consequently is always constant, whatever the quantity of oil left in the cistern. The axle of the float has an indicator on its protruding end, so that there can be readily seen from the outside what quantity of oil remains in the cistern.

In order to equalize the pressure, a pipe connects the gas space of the washer and the air space of the cistern. This pipe serves

also as an overflow, so that if too much oil is pumped up, it flows back again through this pipe into the washer. The oil is run from the cistern through a pipe fixed underneath, with a tap for regulating the outflow. It passes into a tumbling vessel, which empties its contents periodically on to a perforated plate, which distributes the washing oil over the whole section of the scrubber. A charge of washing oil remains in use in the washer, and is pumped up again from the collecting chamber into the reservoir, until the quantity of gas corresponding to the amount of oil has passed through the washer. The oil is then run off into the tar-well. The oil-pump is arranged to work either by hand or by a driving belt, as required.

GAS AND WATER ENGINEERS AT COBURG.

The Association of Gas and Water Engineers of Saxony and Thuringia held its forty-ninth general meeting at Coburg on Sept. 20, under the presidency of Herr ACHTERMANN, Manager of the Annaberg Gas-Works. The Association was welcomed in the name of the town of Coburg by the Burgomaster, Herr Hirschfeld. Zwickau was selected as the place for next year's meeting; and the Association then proceeded to discuss various subjects relating to the gas industry.

Herr Ledig, of Chemnitz, first gave some particulars of the construction and capabilities of a chamber oven, designed by a Brunswick firm, for making coal gas; and Herr Hudler, of Glauchau, spoke of improvements in producer furnaces intended to facilitate the removal of slag. Herr Ledig, of Chemnitz, stated that he had observed a strong corrosion of the iron parts of cyanide extraction washers as a result of air being admitted to the gas prior to these washers; and he had therefore added air to the gas after it had passed through them. The cyanogen products had then, however, acquired such an unpleasant smell that, out of regard to people living in the vicinity, he had had to return to the former practice.

In a discussion on the supply of air to purifiers, the apparatus of Messrs. Klempt and Bonnet, of Duisberg,* was favourably mentioned by several speakers. Herr Achtermann, of Annaberg, stated that, in his liquor and tar wells, he had noticed that the concrete had in several places been transformed into a pulpy mass by the action of the ammonia. He therefore advised that concrete should not be used in the construction of such wells. Herr Zobel, of Zwickau, said he had likewise perceived changes in the concrete at various places in wells which were all but new. Various speakers, however, thought it likely that, in these cases, admixture of some kind had caused the disintegration of the concrete, especially as it had only shown itself in places. There were many very old concrete wells in which no injurious effects from the ammonia had been noticed. After some remarks by Herr Schreyer, of Halle, on the dangers attending the boring of gas-pipes in towns which had electrical cables, Herr Voss, of Quedlinburg, and Herr Martin, of Erfurt, reported favourably, and Herren Schreyer, of Halle, Weber, of Eisenach, and Hudler, of Glauchau, unfavourably of their respective experiences with prepayment gas-meters.

Herr Remané then read a paper on the osmium lamp, which he said would shortly be in the hands of the trade, in a form which he had introduced. Experiments had shown that it lasted for about 1000 burning hours without any decrease in lighting power, and that the energy consumed amounted to about 1·5 watts per Hefner unit per hour. In reference to this, Dr. Lang, of Gotha, said lighting by the osmium lamp was three to four times dearer than incandescent gas lighting, and therefore no great competition was to be feared from the osmium lamp.

Society of Arts.—The following are among the papers to be read at the Wednesday evening meetings of the Society after Christmas: "Industrial Trusts," by Professor W. Smart; "The Cost of Municipal Trading," by Mr. Dixon H. Davies; "Oil Lighting by Incandescence," by Mr. Arthur Kitson; and "The Metric System," by Mr. A. Sonnenschein.

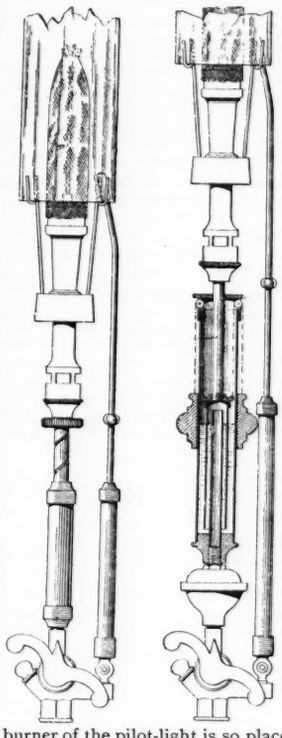
Coal Tar Production in the United States.—According to some particulars given in a recent number of the "Engineering and Mining Journal," the quantity of tar recovered in the manufacture of illuminating gas in the United States in 1900 was computed as follows: The total production of gas was 67,093,553,471 cubic feet, of which upwards of 75 per cent. was water gas. Reckoning the make of coal gas at 20 per cent. of the total, its quantity was 13,418,710,694 cubic feet. The average yield per ton of coal being 10,000 cubic feet, there must have been consumed for this purpose 1,341,871 tons of coal. The yield of tar per ton of coal being, approximately, 5 per cent. by weight, this would indicate a recovery of 67,094 tons of tar. The quantity of water-gas tar was computed from the quantity of oil consumed, which was 194,857,296 gallons. About 25 per cent. of the oil was recovered as tar, corresponding to 48,714,324 gallons, or equivalent to 222,868 tons—a gallon of this weighing 9·15 lbs. (sp. gr. 1·1). The total production of coal tar and water-gas tar in 1900 was therefore 342,306 tons.

* A description of the apparatus will be found in the "JOURNAL," *ante*, pp. 215 and 397.

REGISTER OF PATENTS.

Outdoor Incandescent Gas-Lighting.—Sugg, W. T., of Westminster. No. 23,732; Nov. 22, 1901.

This invention refers more particularly to low-pressure gas-lighting, though some parts are also applicable to high-pressure lighting. The patentee proposes to employ a lantern of the ordinary form (rectangular, round, globular, or other shape) with a closed bottom; the air to support combustion being drawn in from the upper part above a reflector of enamelled iron or otherwise, provided with a chimney more or less long and of varying diameter, according to the number of burners and the pressure of the gas. The object of this long chimney is "to produce a greater or less suction, so as to draw down into the body of the lantern the air to support combustion."



Two arrangements of burner are shown. In the first, the casing is connected with the gas supply-pipe (as usual) in any convenient manner, and provided with a plug cock and bye-pass. Extending upwards from the casing is a cylinder or housing to contain a cork slide. The upper end of the cylinder is closed by a cap provided with a quick internal thread or its equivalent, to correspond with an external thread or groove on the upright tube, provided with a milled nut by which it may be rotated in either direction as desired. To the top of the tube is attached a bunsen burner of any suitable construction. Connected to the bye-pass is a second cork-slide cylinder or housing, with which is connected the pilot-light supply-tube. Upon this pipe is fixed, at a convenient height, a fly-nut, which serves to raise and lower the tube as required—it merely slides in the cylinder, and does not turn. The burner of the pilot-light is so placed as to come just within the cylinder when in its normal position.

When it is desired to clean the chimney, the pilot-light is lowered clear of the cylinder by means of the fly-nut operating on its tube and pushing it down into the cylinder. The tube is then rotated by the nut, so as to bring it within the cylinder, by which means the whole of the burner will be lowered a distance sufficient to enable the attendant to remove the chimney without destroying the mantle. When the chimney has been replaced, by turning the nut in the contrary direction, the burner is raised so as to bring the chimney within the chimney of the lantern. The pilot light is then again raised to its proper height ready for lighting the burner when required.

In the second arrangement, the means adopted for raising and lowering the burner are similar to those employed for an ordinary gasolier—that is to say, the cylinder or housing has an internal tube of suitable length, which enters a kind of gasholder or dip-pipe, the top of which is connected with the burner. The pipe for this purpose carries a collar provided with pulleys for chains, one end of each of which is connected to the dip-pipe, and the other ends to a counterweight sliding externally on the cylinder or housing. In this arrangement, the cylinder contains a liquid seal, which prevents the escape of gas; while in the former arrangement the sealing is effected by the cork slide. By these means, the burner with the mantle may be lowered and raised without any shaking or jarring.

Combined Gas-Generating Plant and Gas-Engine.—Hills, H. G., of Hyde. No. 25,139; Dec. 10, 1901.

This invention of a combined gas-generating plant and gas-engine is designed with the object of dispensing with the ordinary separate cooling tanks, and instead to utilize the water-tank of the gasholder in which the gas produced by the generating plant is stored as a cooling tank for the internal combustion engine in which the gas is consumed as a source of power.

This is accomplished by connecting the water-jacket of the cylinder of the engine, by means of a pipe, to a point at or near the top of the water-tank of the holder, and by another pipe to a lower part of the same tank—creating thereby complete circulation of the cooling water, and in the same manner as if ordinary independent cooling tanks were employed. The chief advantages gained by the adoption of this improvement are the saving of the cost of independent cooling tanks, the saving of water, and economy in ground space, as well as the heating of the gas in the holder as the water becomes heated and before the gas is admitted into the engine.

Gas-Engines.—Junkers, H., of Aix-la-Chapelle, Germany. No. 25,663; Dec. 16, 1901.

This invention relates to gas-engines of the kind in which two pistons move in opposite directions in a common cylinder; and it has for its object to double the output of engines of this type without

necessitating an increase of the crank driving parts required for single-acting engines of the type in question.

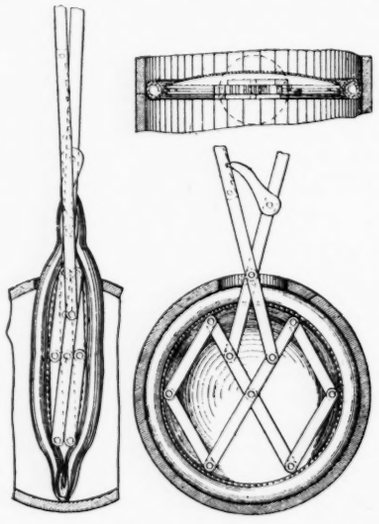
Two cylinders are employed, each provided with two pistons working in opposite directions, and arranged tandem fashion on the same side of the crank-shaft and on the same axial line; their pistons being rigidly connected together in pairs, and transmitting their work to three cranks on the crank-shaft by means of three common connecting-rods.

In one arrangement, the engine has two cylinders fixed tandemwise one behind the other in the same axis, and each containing two pistons arranged in such a manner that they close the two open ends of these cylinders. Of these pistons, one in each cylinder is rigidly connected to one of the two pistons of the other cylinder by means of rods which transmit the work to the crank-shaft provided with three cranks, by means of three connecting-rods. The two forward pistons of the two cylinders are connected together by two cross-heads and two rods connecting the ends thereof (thus forming an oblong framing); and the two rearward pistons of the two cylinders are likewise connected by two rods which are attached to the ends of cross-heads carried by the pistons—thus also forming an oblong framing. The two last-mentioned rods are extended towards the crank, and their forward ends are guided in a straight line by suitable guiding means, and are connected to the rear ends of two outer connecting-rods which transmit the power of the connected pistons to the crank-shaft. The two outer cranks with which these connecting-rods engage are placed 180° in advance of the middle crank, to which the middle connecting-rod that is attached to the two forward pistons engages, so that these pistons move in opposite directions in their cylinders to the other two pistons. The gas mixture is introduced into each cylinder in the ordinary way between the two pistons, in a manner usual in gas-engines with pistons running in opposite directions, and is consumed there. The air or mixture pump which is usually required for working such gas-engines is preferably connected to the engine in such a way that its piston is moved directly by the rods—for example, the piston-rod of the pump can be rigidly connected to the cross-head of the piston most remote from the crank-shaft.

Gas-Main Stoppers.—Postley, A., of New York. No. 19,168; Sept. 1, 1902.

The object of this invention is to provide means for closing a gas-main while repairs are being made or couplings or connections effected.

As shown, the device comprises two rods, bars, or links of the same length and pivotally connected, the ends of which are provided at each side with supplemental pivoted links or bars, which, when connected, form a toggle lever-frame adapted to be expanded and contracted by means of handle levers. Around the frame of the device formed by the links or bars is placed a strong rubber tube, around which is secured a stout canvas covering, which is circular in form and covers the entire frame at one side. The edge of the canvas covering, after being passed around the tube, is secured to pivotal points of the links



or bars. The normal position of the parts is that shown on the left; and when it is desired to use the device so as to stop the gas-main, it is inserted through the opening at the top, and the frame is then expanded by grasping the projecting ends of the handle levers and pulling them apart, and at the same time pushing inwardly thereon. This operation expands the framework of the device, as shown, and causes it to securely close the main; the rubber tube pressing on the walls, and the canvas cover fully closing the central portion of the main.

One of the handle levers is provided, at a predetermined point from their pivotal connection, with a pivoted pawl, which operates in connection with ratchet teeth on the other handle lever; and when the levers are pulled out at their upper end, as shown, the pawl operates to hold levers at any desired point of separation, so that the closure device will remain in the expanded position within the main so as to close it.

APPLICATIONS FOR LETTERS PATENT.

24,557.—Lancaster, E. H., "Generating and supplying combustible vapours for heating and lighting purposes." Nov. 10.

24,558.—Atkinson, J. E., "Incandescent mantle protector." Nov. 10.

24,564.—Dempster, R., and Sons, Ltd., and Broadhead, J. W., "Gas-purifier covers." Nov. 10.

24,565.—Dempster, R., and Sons, Ltd., and Broadhead, J. W., "Regenerator furnaces and the like." Nov. 10.

24,570.—Gibbons, W. P. & G. B. A., "Coke conveyors." Nov. 10.

24,571.—Gibbons, W. P. & G. B. A., "Coal conveyors." Nov. 10.

24,596.—Spery, C. F., "Pressure regulators." Nov. 10.

24,609.—Korff, M., "New or improved illuminating body." Nov. 10.

24,624.—Thomson, R., "Gas producers." Nov. 10.

24,738.—Ross, A., "Manufacture of acetylene gas." Nov. 11.

24,769.—Lindemann, O., "Two-cycle internal combustion engines." A communication from A. Hardt. Nov. 11.

24,783.—Gardner, E., "Tubes for igniting gases." Nov. 11.

24,785.—Scott-Snell, C., "Gas-burners." Nov. 11.

24,801.—Walker, S. S., "Gas pressure-reducing valves." Nov. 12.

24,817.—Kellermann, J., "Protecting device for gas-igniting pillules." Nov. 12.

24,838.—South, A. H. & F., "Protector for gas lighters and torches." Nov. 12.

24,877.—Wall, J. W. R., "Dry gas-meters." Nov. 12.

24,878.—Beanes, W. H., and Werner, Pfleiderer, and Perkins, Ltd., "Gas-producers." Nov. 12.

24,884.—Fourcy, E., and Buire, G., "Distillation of tar." Nov. 12.

24,912.—Mathieson, W., "Rotary motors and pumps." Nov. 13.

24,914.—Melles, J., "Mixing and supplying gases." Nov. 13.

24,956.—Bartlett, J., "Acetylene gas-generator." Nov. 13.

24,972.—Berney, G., "Generating acetylene gas." Nov. 14.

25,000.—Blakeborough, W., "Centre-valve for gas-purifiers." Nov. 14.

25,036.—Layton, A. E., "Supports for use when laying gas and water mains." Nov. 14.

25,038.—Thomson, R., "Internal combustion engines." A communication from C. Brown. Nov. 14.

25,040.—Arenberg, F., "Regulating the gas and air supply to incandescent lights. Nov. 14.

25,057.—Siemens, F., "Regenerative gas-furnaces." Nov. 14.

25,062.—Haddan, R., "Suspending devices for moveable gas-lamps." A communication from Allgemeine Beleuchtungs-und Heizindustrie Actiengesellschaft. Nov. 14.

25,070.—Cooper, E., "Acetylene generators and lamps." Nov. 15.

25,100.—Wells, G. J., "Indicator diagrams and the construction of theoretical figures illustrating the expansion and compression of gases and the like." Nov. 15.

25,130.—Boult, A. J., "Gas heating-stoves." A communication from M. Lee Ross. Nov. 15.

New Gas-Works for Shrewsbury.—The Shrewsbury Gas Company have placed an order for a complete new works, to produce 500,000 cubic feet of gas per day, with Messrs. R. Dempster and Sons, Limited, of Elland. The whole of the plans have been prepared by Mr. W. Belton, the Company's Engineer, under whose superintendance the contract is to be carried out. The new works are to be built on a site adjoining the present works, and will include four arches of inclined retorts with Waddell's patent regenerator, coal breaking and elevating machinery, patent hot-coke conveyor with water-jacket, patent inclined-retort house (the height of the new building being 20 feet less than has hitherto been usual), and purifiers on Green's system. The order was given on the 8th inst., and work has already commenced. The firm do the whole of it without sub-contracting.

The Proposed New Gas-Works for Aberavon.—At an adjourned quarterly meeting of the Town Council of Aberavon held on Wednesday, an extraordinary attitude was adopted by the members by defeating a recommendation of the Gas Committee that application should be at once made to the Public Works Loan Commissioners to borrow the money sanctioned by the Local Government Board for the construction of the proposed new gas-works, and the carrying of an amendment that the works should not be proceeded with for three years, which was tantamount to abandoning the scheme. The Council some time ago entered into provisional contracts for the works, subject to the sanction of the Local Government Board being obtained. The contracts, however, were not under seal; and the Council, taking advantage of this fact, have now decided not to go on, despite the circumstance that for a long time past gas managers and gas engineers have advised them to do so. The action of the Council is much debated in the town.

The Question of Forged Transfers.—In "The Times" last Wednesday, "A Banker" replied to the letter by Mr. H. D. Ellis on the above subject given in the "Journal" last week. He said: "No doubt your correspondent Mr. H. D. Ellis has a banking account, and when he opened it he gave his banker a specimen of his signature for his guidance. It is the banker's duty to compare all future signatures with this specimen, to see if they are genuine. If he pays on a forged signature, he loses the money. He is not allowed to set up the excuse of gloves, strange tables, or unaccustomed pens. Now, why should corporations and companies be permitted to take up a different position? They are the custodians of the stocks or shares of their stock and share holders, just as a banker is the custodian of his customers' money. When a stock or share account is opened in the register of a corporation or company, it is done by a deed of transfer, the signatures to which are duly verified, and which remains in the possession of the corporation or company. All future transactions on the account must be by similar deed duly signed by the registered holder, whose signature can, and should, be compared with that of the original deed held by the corporation or company. I think it will take much stronger arguments than I have met with yet to convince ordinary business men that there is any greater difficulty in this than a banker has always to cope with in his business."

CORRESPONDENCE.

[*We are not responsible for opinions expressed by correspondents.*]

The Question of Purifier Area.

SIR,—I am not in the habit of replying to any adverse criticisms of points contained in the "Handbook for Gas Engineers." It must be admitted that such criticisms are few and far between. It is not to be expected, where so much is to be said and written, that there should not be some difference of view. Certain remarks, however, made in the "Crystal Palace District Gas Company's Purification case," reported in this week's "JOURNAL," and your leader thereon, on the question of purifier area, seem to call for a word from me.

It is not right to say that unless the area given in the "Handbook" is secured, the gas sent out will be impure. If that were so, then many gas managers would be sinners in this respect. The rule which I give for the area of purifiers includes other considerations besides that of efficient purification. It includes, for example, the item of economy in working. Perhaps I ought to have stated that; but one does not always express everything that is in one's mind, especially when the inference should be obvious to the meanest understanding. Curious to say, it was overlooked or ignored by the witnesses in the case, both for and against.

With all respect to the writer of the leading article, the rule which I give is not to be hustled aside with the remark that "the rules born of practical experience are much to be preferred to any amount of text-book formulæ." That may be so in some cases; but there is no justification for your suggesting that the rule in question given in the "Handbook" is not "born of practical experience." I venture to say that it is based on a practical experience larger and more diverse than that of any other living gas authority. And it will stand.

5, *Norfolk Street, Manchester, Nov.* 20, 1902. THOMAS NEWBIGGING.

[It is sincerely regretted that Mr. Newbigging has apparently read into the remark which he quotes from the leader in last week's "JOURNAL" a suggestion that was absolutely absent from the mind of the writer. There was no intention to be discourteous in any way to Mr. Newbigging or to the rules contained in his invaluable and world-recognized "Handbook." Most text-book formulæ, as in the case in question, *are* born of practical experience; but here we were speaking of a particular set of circumstances, in which two expert witnesses named expressed, with an intimate knowledge of the operation of the particular works, certain views which were opposed to the views of a third witness, whose figures were based on the "generally accepted formula." "The rules born of practical experience," under those conditions or any other particular set of conditions, "are much to be preferred to any amount of text-book formulæ." The truth of this no one knows better than Mr. Newbigging, with his large diverse experience in technical gas matters.—ED. J. G. L.]

Prepayment Meter Law.

SIR,—I am sorry that you should consider the views I have put forward as evidence of my favouring a policy of "irritation" rather than of "conciliation." As a matter of fact, within my limited sphere, I have always strenuously preached "conciliation" tempered by expediency; but evidently, in regard to the particular point in question, the writer of your leader, if he writes from experience and not on theory, has had experience different from mine, and our ideas as to what constitutes expediency consequently differ. What apparently is not realized is the great difficulty of proving satisfactorily whether or not a consumer has exercised reasonable care, or has robbed his own meter, or has knowingly permitted someone else to do so. The meter is entrusted absolutely to the care of the consumer; and my opinion is that the onus must be put on him to prove that the robbery has occurred in spite of his having taken every possible precaution, rather than on the gas company to prove the contrary. The company are, in the nature of things, without witnesses in the great majority of cases. I was not referring to cases of proved theft; it hardly needs a knowledge of the law to understand how a convicted thief can be dealt with. You say there is no hardship in forcing the consumer to suffer the consequences if he has not taken reasonable care of the meter. How do you propose to prove he has not? Or do you propose to accept his assurance unless you have substantial evidence to the contrary?

There is one thing to be said. My experience refers to the circumstances in large cities with masses of poor people constantly shifting, so that in most cases little is known by the officers or employees of the companies as to the character of the individual consumers. In small towns, where the industrial population is more of a fixed quantity, and the individuals comprising it are much better known, it may be easier to divide the cases of real hardship from those of carelessness and dishonesty. In the large cities, it is practically impossible; and to deal leniently with all cases except those in which positive evidence against the consumer is obtainable is to put a premium on dishonesty, and would very soon considerably swell the loss from broken money-boxes. As to the contract being signed, but not comprehended. It is a very simple matter to make it a rule that the employee obtaining the contract shall say to every consumer signing: "Now, you clearly understand, do you not, that you are responsible to the company for the money in the meter, and that if the full amount is not there when the collector calls, you will have to pay?" The most ignorant man or woman can understand that; so that the "legal verbiage" argument constitutes no difficulty.

In conclusion, gas companies have not been compelled to concede "the right of consumers to consideration in this matter" at the point of the legal bayonet. They have only had the necessity of obtaining a reasonable protecting contract forcibly pointed out to them. It must not be overlooked that the Lords Justices, in giving judgment in the Longton case, intimated that, had the action been brought for negligence, "different considerations might have arisen"—which hardly looks as though they were of opinion that the consumer had special claims to consideration. It was merely his luck that the Corporation had no contract, and sued for payment for the gas consumed.

Conciliation, by all means; generous treatment, by all means—if expediency permit. And, of course, to argue in the abstract about expediency (which depends upon particular circumstances) is almost as futile as to dispute about tastes. In practice, perhaps, there would be little between us!

Nov. 19, 1902. LEX.

[We must thank our correspondent for having so courteously placed before our readers what he is pleased to regard as the "practical" view of this question, as opposed to what he is equally pleased to term the "theory" expounded in our two editorial references to the subject. It seems to us, however, that the plea for the "favourable consideration" of the "geese that lay the golden eggs" to which we ventured to give utterance is well worthy of the careful attention of gas managers, in spite of everthing that has been advanced by "Lex." Our correspondent quotes a remark made by the Judges of the High Court in the Longton case, as showing that, in this instance at least, the consumer had no special claim to consideration. But, with due deference, we fail to see why any such construction should be placed upon the words. According to our special report of the case, what their Lordships said was this: "Had the action been brought against the customer for negligence in respect of the box, different considerations might have arisen; *but it was clear that consumers could not be called to pay twice over, when they had fulfilled the contract under which the gas was supplied.*" If this is not being forced to concede the rights of consumers in this matter, we do not know what is. That different considerations might have arisen had the action been brought against the customer for negligence, appears obvious, seeing that a totally different issue would have been tried. We are quite prepared to admit the difficulty of proving whether or not a consumer has taken reasonable care of his meter, and also that this difficulty is much greater in some places than in others. Indeed, that was already admitted in the last article, when saying that "it must be left for each manager to decide for himself how far, in his particular instance, it is wise for him to follow this advice"—the advice being to treat a consumer as honest until some satisfactory evidence is forthcoming that he is dishonest. This difficulty, however (great as it may be), does not affect the justice of the case; and gas managers should, in dealing with the question of the disappearance of money from prepayment meter boxes, as in other matters, "be just and fear not." How far they can afford to be generous beyond bare justice, is precisely where the question of expediency comes in; and this each must decide for himself.—ED. J.G.L.]

High-Pressure Gas Lighting.

SIR,—The question raised by Mr. Thomas Fletcher regarding the difficulties in connection with the use of high-pressure gas for ordinary house lighting are not so serious as they appear to be. In the first place, one would certainly not expect to give from 20 to 60 inches pressure to a dwelling-house under present conditions as to meter, pipes, and fittings; but with (say) 5 inches pressure, and a reducing-valve for stoves and flat-flame burners, the higher pressure, for incandescent burners, would be perfectly safe. We do not find it difficult—for office, factory, or workshop purposes—to take flat-flame burners, where necessary, from a 25-inch pressure pipe.

The hissing sound in high-pressure lighting is due more to the construction of the burners than to any of the fittings. The 1000-candle power burner we are making here will, at 25 inches pressure, if properly adjusted, give (according to its size and power) less noise than an ordinary low-pressure incandescent burner. Of course, a 1000-candle power burner would not be placed in a room 12 feet square, for instance; but in the equivalent space to be lighted, the noise is inappreciable.

Royal Arsenal, Woolwich, Nov. 17, 1902. A. W. ONSLOW.

PARLIAMENTARY INTELLIGENCE.

PROJECTED GAS LEGISLATION FOR NEXT SESSION.

Notices which have appeared for Bills in the next session of Parliament indicate clearly that the subject of the gas supply of the Metropolis will demand a considerable amount of attention in the Committee-Rooms.

The Gaslight and Coke Company intend to apply for power to raise additional share and [or] loan capital, to alter the existing, and [or] provide another, standard price, as fixed by the Company's Act of 1876, and to alter their "authorized price" and [or] "authorized rate of dividend." It is proposed to create a redemption fund for reducing the capital, and make all incidental provisions. Authority will be sought to purchase certain lands in the parish of East Ham, and to

erect thereon works for the manufacture of gas and the conversion of residual products. An extension of time for the sale of superfluous lands, and the alteration or repeal of provisions of the Lands Clauses Act, 1845, with respect thereto, will be applied for. The Bill to be promoted will make consequential and other amendments in the Acts affecting the Company.

The Commercial Gas Company have notified their intention of applying for a Bill to make provision with respect to the testing of the illuminating power of their gas and the burner to be employed therein and the method of using the same, and to alter, amend, or repeal the provisions of the Commercial Gas Act, 1875, as amended by the Commercial Gas Act, 1902 (and especially sections 52 and 34 of the first-named Act relating to the above matters), and any other Act or Acts affecting the Company or their undertaking. They will also seek to vary or extinguish all or any rights or privileges inconsistent with, or which would interfere with, any of the objects or purposes or provisions of the Bill, and to secure other rights and privileges.

The London County Council intend to promote a Bill to alter the existing provisions of the Acts relating to the Gaslight and Coke Company with respect to the price which may be charged by the Company for gas supplied by them and with respect to its illuminating power; to reduce the illuminating power as now prescribed, and also the standard price as fixed by the Company's Acts, and to alter the provisions of those Acts with respect to the sliding-scale sys'em of price and dividend and the amount of the price and rate of dividend, and to make other provisions in lieu thereof, and (if thought expedient) to provide for a secondary or additional sliding-scale; and to provide for the reduction of the price charged by the Company within that part of their district which is north of the River Thames to such an amount as may be prescribed in, or provided for by, the Bill. It is sought to repeal or amend sections 19 and 25 of the Gaslight and Coke Company Act, 1876, and to repeal or amend sections 15 and 16 of their Act of 1898, and any other provisions of any Acts relating to the illuminating power of the gas, the price to be charged, and the dividend to be paid, and to provide that the standard price, as fixed by section 19 of the Act of 1876, shall be reduced to such an extent as may be defined in the Bill. The Company will be required to make provision for the redemption of some of their ordinary stock, and to set aside, in order to form a redemption fund for this purpose, such a proportion of money otherwise applicable to dividend as may be prescribed by the Bill; and also to make provision for the application of such fund in the purchase of stock for redemption and cancellation by the Company, or such other persons, and in such manner and subject to such conditions, as may be prescribed. They will likewise be required to provide and fix free of charge to all consumers of gas such governed or other burners as may be prescribed by the intended Act, or as may be suitable for burning gas of the illuminating power proposed to be prescribed thereunder. Provision will be made for the payment of the costs and expenses of the Bill and the intended Act by the London County Council or otherwise in such manner as may be therein defined. The Bill will vary and extinguish all such rights and privileges as will interfere with any of the objects above mentioned, and may repeal, alter, or amend any of the provisions of the Local and Personal Acts referring to these matters, and especially sections 19 and 25 of the Company's Act of 1876, and sections 15 and 16 of their Capital Consolidation Act of 1898.

The Crystal Palace District Gas Company have given notice of their intention to apply for authority to change the name of the Company to that of "The Sydenham and District Gas Company," or such other as may be defined in the Bill. It is proposed to repeal or modify provisions of the Company's Acts with respect to the quality, illuminating power, purity, and price of gas, and the quantity of sulphur compounds other than sulphuretted hydrogen to be permitted therein; also, to alter the provisions with regard to the standard price and the sliding-scale. The Company will seek authority to supply to the consumers who may require them "burners suitable for the proper consumption of gas of the illuminating power proposed to be supplied;" and to make provisions with respect to "the method of testing the illuminating power and purity" of the gas. Certain lands at Bell Green, Lower Sydenham, are to be acquired, and permission will be asked to use them and other lands for the erection of cottages and other purposes of the undertaking, notwithstanding existing restrictive covenants and conditions. Special provision will be made for the issue, sale, or transfer of stock to consumers of gas supplied by or to persons in the Company's service, and for the election of a director or directors by employees holding such stock. Any Acts conflicting with the above proposals are to be amended.

The North Middlesex Gas Company intend to apply for power to raise additional capital, and to make further provision with regard to depreciation, insurance, and reserve funds. It is proposed to repeal section 62 of the Company's Act of 1895, and provide that the standard price, the dividends, and the payments to the insurance fund shall depend upon the profits for each half year instead of each year. Other provisions in the Bill to be applied for will relate to the regulation of the supply of gas generally, gas engines, fittings, &c., the prevention of waste, the erection of workmen's cottages, and other matters.

The Harrow and Stanmore Gas Company wish to acquire, compulsorily or by agreement, certain lands at Roxeth, in the parish of Harrow, and construct and maintain thereon additional works for the manufacture of gas and the treatment of residual and other products. Further capital will be sought. The Bill will include provisions in regard to fittings, &c., the laying of pipes in private roads and for ancillary purposes, and various other matters.

Among the applicants for additional powers by Bills next session will be the Gas Companies in the following provincial towns: Billinghurst, Bridgwater, Broadstairs, Burgess Hill, Derby, East Ardsley, Faversham, Gorleston and Southtown, Hexham, Ipswich, Maidstone, Market Drayton, Nantwich, Norwich (British Gas Company), Plymouth, Rickmansworth, Scarborough, Sittingbourne, Walker and Wallsend, Wellington (Salop), and Winchester. Particulars of these and the other applications to Parliament will be given next week, when all the notices will have come to hand.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—KING'S BENCH DIVISION.

Monday, Nov. 17.

(*Before Mr. Justice* LAWRANCE *and a Special Jury.*)

Waters and Wife v. Brighton and Hove General Gas Company: Alleged Poisoning by Water Gas.

In this case the plaintiffs claimed damages for injuries sustained in consequence of the alleged negligence of the defendants or their servants. Defendants denied both the negligence and the damage.

Mr. MARSHALL HALL, K.C., Mr. HOHLER, and Mr. PITMAN appeared for the plaintiffs; Mr. BRAY, K.C., Mr. BOXALL, K.C., Mr. BOYDELL HOUGHTON, and Mr. INGLEBY ODDIE represented the defendants.

On the hearing being resumed this morning, witnesses were called on behalf of the defendants.

James Crossthwaite, a gas-fitter, said he had served seven years' apprenticeship to a gas-fitting firm, and had also worked for nine months as a journeyman before entering the Gas Company's service in November, 1901. It was not true that he had done nothing but clean stoves for the Company before doing the job at the plaintiffs' house. On the 23rd of December last year, in accordance with orders from the Company, he went to the house, and, after putting the pipes on to the gas-stove, blew into them and shut them up. After leaving them for about ten minutes, he got air back, which was an indication that there was no leakage. He had no conversation with Mr. Waters about gas-brackets. He then turned the gas into the pipes at one o'clock, and set the meter; and on returning to it at half-past four, he found only a quarter of a cubic foot of gas had passed. This satisfied him that the pipes in the house were holding good. After that he lit up the gas-fire, but found there was not enough gas to supply it. He attributed this to the small pipes. Faulkner told Mr. Waters the pipe was not large enough, and Mr. Waters said he would try it for that night, and if it was found unsatisfactory, an estimate could be given for larger ones. On the morning of the 24th, witness went again to the plaintiffs' house about half-past nine to fix two lustre fires. He saw Mrs. Waters, who said there had been an escape of gas, and that her husband had gone to the Gas Company. She said it did not affect her, but it did her husband, as he suffered with his chest. Witness went up with Mrs. Waters into the bedroom, and pulling the curtain aside on the left hand, found another pipe with a wooden plug in it and a slight smell of gas. Witness said the escape of gas was not in his work, and he then removed the wooden plug and put on an iron one. It was not true that he pointed to the right-hand pipe and then to the left-hand one and said: "I plugged this one but forgot the other." The wooden plug was so tight that he had to use his pliers to get it out. He estimated the escape from such a plug would be about 0·1 cubic foot per hour. He put the plug into his basket, and soon after told his mate to clear out the basket, and it disappeared. On the 27th, witness went and saw Mr. Waters, who said he had a "beautiful cold over this job, as he had had no fire to get up by." Witness denied that he had ever said the escape was his fault. It was not true that he had been dismissed from the Company's service and taken on again.

Cross-examined by Mr. MARSHALL HALL: He first went to Mr. Waters's house at 10.30 a.m. on the 23rd of December, and the first thing he did was to find where the pipes ran, which was done by taking up the boards. It was untrue for Mr. and Mrs. Waters and the servant to say that they saw the pipes, and asked witness where they ran to. If he had found the second pipe, he should have stopped it.

Mr. MARSHALL HALL: What was the difference in the plugging?

Witness: One must have fitted tighter than the other.

Do you think air might have passed the first plug?—A little air might have passed,

And the second?—It might, but it did not.

What made you say the leak was not in your work?—Because it was not.

But you would have stopped the second bracket if you had seen it?—Yes.

Cross-examination continued: He watched the hands of the meter now and then during the 3½ hours, and the index only recorded a quarter of a cubic foot of gas over the whole system. The pressure he put on the pipes in blowing was produced by his mouth, and when he opened the taps again the air came out. He did not know this was a temporary job; but he had an idea that it would come out the next day. However, he took as much care with it as if it had been a permanent job. He did not go to the meter again after he lit the gas-fire. The second plug was tighter than the first, because it had a thread in it.

Mr. MARSHALL HALL: When you went on the 24th, Mrs. Waters told you there was a leak?

Witness: Yes; but I could not smell it till I went right up to the window.

You said it was not in your work. But it would have been if you had found it?—I should have put a plug in the pipe, as I did with the first one.

You were surprised to find a second pipe. Do they mostly have one?—Yes; but they do not have them near the window, because of the danger of fire to the curtains.

If you had looked for this second pipe, you would have found it?—There was no pipe showing.

But we now know there was another T-junction. Was it not your duty to find that?—No.

Why? There might have been a leak?—No; I tested it.

If you had taken up a board near the window, you would have exposed the second T?—I did not know how far the T was.

But we now know it is under the window?—I had no need to take up the board.

Cross-examination continued: It was the duty of the fitter and not

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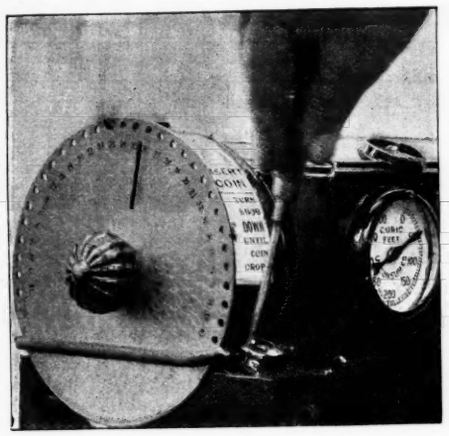

Fig. I.
Break Company's Seal and Remove Screw—THUS.

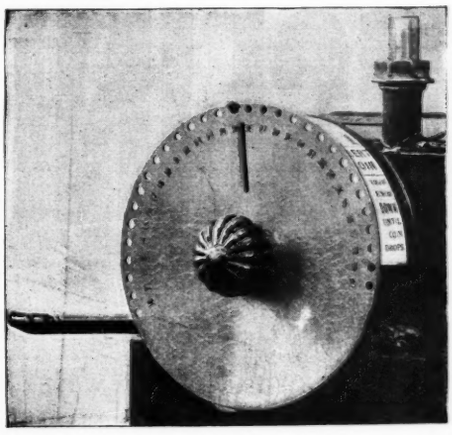

Fig. II.
Swing Band Back—THUS.

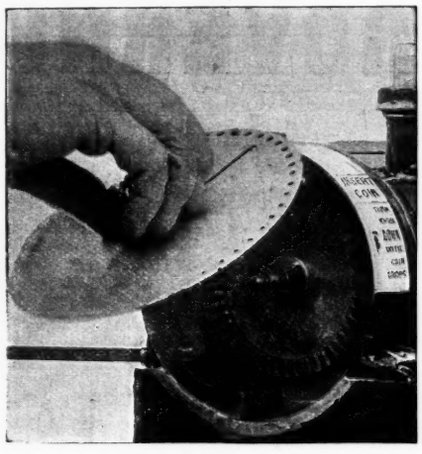

Fig. III.
Lift Plate Off—THUS.

Fig. IV.
Replace Plate—THUS.

Swing Band Forward—Replace Screw—and Re-seal.

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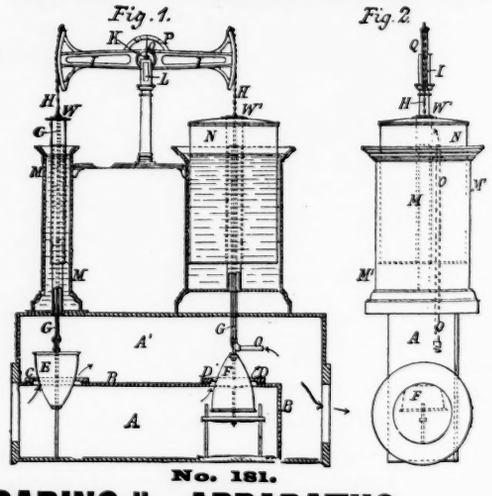

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the foreman to test the pipes. He thought it was two months after the occurrence before he was asked to make a statement.

Re-examined by Mr. BRAY: It never occurred to him that the plug would be an important thing to keep.

W. Matthews, fitter's mate to the previous witness, said he was discharged because he took a holiday without permission. He agreed with Crossthwaite's account of the finding of the gas-bracket on the right side of the window, and plugging it, and also as to testing and setting the meter.

Cross-examined by Mr. MARSHALL HALL: He was not asked to speak about his evidence till the previous Friday, and he did not hear Crossthwaite's evidence till the morning. Having found the bracket on one side of the window, it did not occur to them to look on the other side.

Mr. *Sandeman*, chief foreman to the Company, said he went on the 24th of December to the plaintiff's house to see Mr. Waters, but found he was out. On the 27th, he called again; but then he was out. On the 30th he found him in bed. He denied that he had told Mr. Waters that the escape was the fault of the Company's men. He considered Crossthwaite a very good fitter, and he was still in the Company's employ.

Cross-examined by Mr. MARSHALL HALL: He thought it was proper work to do what Crossthwaite did, and he did not think he was bound to take up the board by the window to see if the pipe was "teed" off to another point. Pressed as to a conversation which Mr. Waters said took place between himself and witness, he admitted a good deal of the conversation, but denied the part in which Mr. Waters said witness admitted the incompetency of Crossthwaite. A good deal of the conversation Mr. Waters had repeated was true. The only part he denied was that which, if true, would affect the Company.

Mr. *A. Easton*, the Company's Chemist, said his duty was to make a daily test of the gas, in order to ascertain how much carbonic oxide it contained. He used Professor Hempel's test, and the result was entered in a book. On the 23rd of December, the proportion of carbonic oxide was 13 per cent. He also took the pressures of the gas; and on the day named it was from 20-10ths to 30-10ths. In the early morning it fell to 15-10ths; and there would be much less escape in consequence in the early hours, as the pressure would be less.

Robert Boswell, a foreman in the employ of the Gaslight and Coke Company for 26 years, said he had heard Crossthwaite's evidence, and his opinion was that he had done quite correctly. The tests used were sufficient. He did not think that the gas which escaped that night would have hurt a baby.

Mr. *G. F. L. Foulger*, Chief Distributing Engineer of the Gaslight and Coke Company, said he had heard Crossthwaite's evidence, and considered the tests he applied were the best; they were those in general use—viz., first the blowing test, and then the meter test. He considered the former was a delicate test, and an hour would be an ample test for the meter. The amount of escape was a quite inappreciable quantity. He had seen a good many cases of gas poisoning, and it was very difficult to tell the difference between the condition of a person so poisoned and that of one intoxicated. Many of his own men had been arrested while they were affected by gas. The usual remedy he employed was to give brandy and milk, to produce sickness. He did not recollect a single fatal case among the workmen. He did not know the proportion of carbonic oxide in the gas of his Company, but he should think it was about 13 per cent.

Cross-examined by Mr. MARSHALL HALL: His Company had used water gas since about 1889; but he did not think there had been an increase of poisoning among the men, nor did he consider it was necessary to take greater care with the fittings now. He had never seen a case where a man had inhaled a large quantity of the gas at night. He believed one of the Directors of his Company was also on the Board of the Brighton Company.

Mr. *Joseph Cash*, Engineer of the defendant Company, said he received a complaint from the plaintiff, and saw Crossthwaite and went fully into the matter. If what Crossthwaite said was true as to the escape being a quarter of a cubic foot in 3½ hours, that would show a quantity of carbonic oxide of 1-25,000th part in the atmosphere of the plaintiffs' bedroom.

Cross-examined by Mr. MARSHALL HALL: The impression he gathered was that there was no escape of gas of any importance, and that the claim was an unjust one, which it was his duty to resist.

Mr. MARSHALL HALL: Is there any advantage, except to the Gas Company, in supplying water gas?

Witness: I think there is an advantage to the public.

What is the advantage; a reduction of 2d. per 1000 cubic feet?—Not only that, but it enables the gas to be more perfectly consumed, and therefore it does not vitiate the air of the room so much.

You are a great advocate of the use of water gas, and have said you would not hesitate to supply it pure?—I said I would not hesitate to do so, if I was forced by circumstances.

What percentage do you usually give?—About 25 per cent.

In this case there was 31·69 per cent.?—Yes; on that occasion.

You would not mix it in equal proportions?—I should not hesitate to do so. I have gone up as far as 43 per cent.

It is a well-known fact that in America, since water gas has been supplied, the number of cases of poisoning has largely increased?—I do not know; I have heard so.

If there had been the escape of gas we suggest, the symptoms of Mr. Waters would be to a certain extent justified?—He would be affected to a certain extent, but I cannot say how much.

Professor *Vivian B. Lewes*, F.I.C., F.C.S., said he had been under the influence of coal and water gas, and had seen many cases of poisoning; and he gave evidence before the Departmental Committee in 1898. The mixture in London had varied in the past ten years from 7 to 13 per cent.; and he should be perfectly prepared to distribute gas with 16 or 17 per cent. of carbonic oxide in it. If, as had been said, there was an escape of 4½ cubic feet of gas into the room, it could, in the circumstances, be breathed by anybody without ill-effects. It might give a person a headache, but nothing more. In his opinion, the cause of what Mr. Waters complained of was insufficient combustion in the stove. They had too small a supply-pipe, and instead of getting about 32 cubic feet of gas per hour, they would probably get only half this quantity. Directly they reduced the size of the pipe to one which was insufficient for proper combustion, they got the products of insufficient combustion, which in themselves were much more poisonous than any amount of water gas. After listening to the evidence in the case, he was distinctly of opinion that the trouble was not brought about by the escape of gas, but was caused entirely by the products of incomplete combustion. With such a stove as the one used and the chimney cold, these products would collect in the chimney, and when the gas was turned out, they would descend into the room, and affect the sleepers. The smell of which the plaintiff complained was also exactly the smell accompanying incomplete combustion. With 4½ cubic feet of gas leaking into the room, with a low outside temperature and a fairly warm air inside, and with three windows and a fireplace, they could never have reached a percentage of carbonic oxide in the room that would give rise to the symptoms Mr. Waters complained of. He was quite familiar with the symptoms of carbonic oxide poisoning, and had never seen spitting of blood, as Mr. Waters said he had. His experience of this kind of poisoning was that it was narcotic rather than irritant. He thought there was a great mistake about the effects of carbonic oxide poisoning. The usual effect of breathing this gas was to prevent the oxygen from going properly to the various parts of the body, and that lowered the system; so that if a person was predisposed to any disease, this was just the time when it might be taken. It was the same with all lowered conditions of the system. But the air in a room like the one in question would certainly be quite changed through the cracks, &c., of the doors and windows once in an hour. A man gave out 6 cubic feet of carbonic oxide in ten hours; and the size of rooms allowed by ventilating authorities showed that they calculated the air would be changed three times an hour.

Cross-examined by Mr. MARSHALL HALL: He had seen the tables of the experiments made by Dr. Haldane; but it would take a Senior Wrangler several hours to work out all the details. He should not in the least mind going to bed in a room with 4½ cubic feet of gas escaping into it, with 13 per cent. of water gas in it.

Mr. MARSHALL HALL: Do you know that in the Departmental report Dr. Haldane says: "A moderate escape of gas from an ordinary bracket is almost more dangerous to a person sleeping than a great escape; and it is evidently unsafe to remain in a room where gas has been escaping until all parts of the room have been thoroughly ventilated?"

Witness: I disagree with that.

You gave evidence before the Committee?—Yes.

And Dr. Haldane did not agree with you?—That is the great beauty of scientific men; they never agree with each other.

Justice LAWRANCE: You could not have said a truer thing.

Mr. MARSHALL HALL: If your figures are right, and this change of atmosphere takes place every hour, it would be almost impossible to be poisoned by carbonic oxide.

Witness: Yes.

When you took the gas yourself, you were awake?—Yes.

Much more dangerous than if you were asleep?—Yes.

What is your opinion of the case?—I think it is one nearly parallel with that of Zola. I do not think it is a case of fraud at all.

Mr. *Waters*, recalled by Mr. BRAY, said he ascribed his bankruptcy to ill-health, bad debts, and an unfortunate partner. He was under a Dr. Pearce for sciatica and rheumatism. His partner was a Mr. Waller, who promised to introduce a large quantity of business, but was not able to do so. Witness was further examined as to the details of his life previous to his bankruptcy.

Sir *Hugh Beevor*, M.D., said he had made a special study of diseases of the chest, and had examined the plaintiff. He found both his chest and throat normal, but any symptoms which he had previously complained of were not to be attributed to gas poisoning, but to an attack of influenza or catarrh, which came on at that time. There was no evidence of carbonic oxide poisoning in Mr. Waters's case. He found, by recent examination, that his lungs were not in so good a condition as they were in June; and he attributed this to the existence of some tubercle there, but that was not caused by gas.

Cross-examined by Mr. MARSHALL HALL: He admitted that cases of pneumonia had followed cases of poisoning by carbonic oxide; but these were generally where the person had been brought to death's door by the poison, and any other disease might have followed. He did not think that Mr. Waters had absorbed sufficient gas to vitiate his vitality to any appreciable extent.

By Mr. BRAY: Gas poisoning would not cause the formation of a tubercle in any way.

Dr. *Heron*, who examined Mr. Waters with the last witness, said he was of opinion that the tubercle which he thought Mr. Waters had was not caused by gas poisoning. The present condition of Mr. Waters could, in his opinion, have no connection with gas poisoning.

Tuesday, Nov. 18.

On the hearing being resumed this morning,

Dr. *Heron* was recalled, and, in reply to Mr. BRAY, said an inhalation of gas would affect both lungs; but if the condition of Mr. Waters was as witness said, one lung only would be affected.

Mr. BRAY: Then as Mr. Waters has only one lung injured, his condition agrees with injury by tubercle, but not by gas poisoning.

Witness: That is so.

Cross-examined by Mr. HOHLER: He had been affected by gas poisoning himself. He did not think that in normal cases one lung would have a greater resistive capacity than the other. He asserted positively that gas poisoning had nothing to do with the condition of Mr. Waters.

By Justice LAWRANCE: He thought the blood-spitting which affected Mr. Waters on the morning after the escape of gas was due to an attack of tuberculosis which might afterwards disappear. The peculiarity of tuberculosis was recurrence.

Dr. *H. Cripps Upton*, of Brighton, said he had had experience of gas

poisoning, and had examined the room occupied by the plaintiffs on the 23rd of December. He should say the air in the room would be changed about every hour. He had examined Mr. Waters in company with Dr. Morgan, the plaintiffs' own doctor; and he came to the conclusion that his complaint had nothing to do with gas poisoning. He was suffering from anæmia, irritable condition of the larynx and windpipe, and general debility, with a suspicious action of the heart, but no disease. He had seen a servant girl under the influence of gas poisoning, and she seemed to all appearances to be dead-drunk. That was a case where the gas had been turned on in the room, but not lighted. It was about six hours after this girl was removed from the room before she began to recover consciousness.

Cross-examined by Mr. HOHLER: Dr. Morgan, who was present with Mr. Waters, said he would prefer not to give any information to witness. Mr. Waters had been suffering from hæmorrhage; and this, in witness's opinion, was quite inconsistent with gas poisoning. He admitted that he wanted to view the case from the standpoint that there was only a small amount of carbonic oxide in the air.

Mr. *H. Bowen Perkins*, a physician and surgeon, said he was Medical Officer to the Gaslight and Coke Company at Barking, where a number of the men who worked for the Company lived. During the last few years he had had a good deal of experience of cases of gas poisoning. The effect was usually narcotic; and in serious cases the patient became unconscious. In such a case a man would not be able to walk for some hours, but in about a week he would have entirely recovered. He had not known gas poisoning to have any effect on the lungs, though it might temporarily irritate the bronchial tubes. He had not known cases of pneumonia or lung congestion follow poisoning.

Cross-examined by Mr. HOHLER: He had not examined the plaintiff at all in this matter. He had had no experience of a case of gas poisoning where bad results had followed. If a man had been poisoned to such an extent as to become unconscious, he could not go out three hours afterwards. He had never known violent retching, but only slight retching, follow gas poisoning. He attributed Mr. Waters's illness to gastric trouble. In his opinion, gas poisoning was not sufficient to produce bleeding from the lungs; but violent retching might break a small blood-vessel, and so produce bleeding. He asserted that a man might go to twenty doctors, and if he had only a small tubercle none of them might find it.

Re-examined by Mr. BRAY: He had probably had more experience of cases of gas poisoning than anyone, and he had never known a case with such symptoms as those of Mr. Waters.

Mr. BRAY proceeded to address the Jury on behalf of the defendants. He said he had never hesitated to submit that Mr. Waters had wilfully exaggerated his injuries, and had told several distinct untruths. A case like this must always depend on the credibility of the principal person, whether he was entitled to recover or not. He had been contradicted in several material points by Crossthwaite and Mathews, as well as by one or two others; and though he had been corroborated in one or two instances by his wife, he had conspicuously not been corroborated by her in others. He (Counsel) should submit to the Jury that Mr. Waters had failed to satisfy them that he had been seriously injured, and he should ask them to accept the witnesses of the defendants in preference to those of the plaintiffs.

Mr. HOHLER, in replying for the plaintiffs, called the Jury's attention to the much more moderate tone of Mr. Bray's later remarks. At first he did not hesitate to hurl charges of fraud against the principal plaintiff; but his witnesses had not reached his expectations, and hence the change in the view of the learned Counsel. He emphasized the fact that the defendants had not called a single independent witness to say that the gas fitters, when they left the house with an escape, had done their duty in a fit and proper manner. The question the Jury had to determine was what was the contract between Mr. Waters and the Gas Company, and whether reasonable and proper care had been taken in the performance of it. The defendants had no doubt been supported by the Gaslight and Coke Company; but it was a monstrous thing for them to come there and say the work had been properly carried out, in view of the absence of independent witnesses, while the plaintiffs had called at least three experienced and independent witnesses to show what ought to have been done. Either the tests had not been applied at all, or they were absolutely inadequate.

Mr. Justice LAWRANCE, in summing up the case, said the main question for the Jury was whether the defendants had been guilty of negligence. If it was found that they had, the only other question to be decided would be the amount of the damage which the plaintiffs had suffered through this negligence. The whole thing arose out of the fixing of a gas-stove in plaintiffs' house; and it would be for the Jury to say what was the duty of the persons who went there for the purpose of fitting it up. He did not give an opinion one side or the other, but he should have thought a good safe way would have been to put plugs into the T-piece that was found, and then they would have stopped everything. One would have imagined that the duty of the defendants was, at all events, to see that the pipes were fixed in such a way that they would do no harm to anyone by their not knowing where the pipes went. There was some water gas used in this gas, and that was, no doubt, more dangerous to life than the other gas; so that it was a matter of great importance not only to trace the pipes, but to see that they were in good condition. But this was not done; and, as the result, the plaintiff alleged that he was injured by an escape of gas. But the defendants said this was an exaggerated claim, and that the plaintiff had no right to recover; and the Jury would have to decide between them. As to the question of water gas, they had heard a great deal about it; but he was not going into this matter. If the Jury believed the plaintiffs' evidence, there must have been a greater escape than could have come from a defective wooden plug; but he much regretted that the meter had not been taken the next morning, as this would have thrown great light on the whole subject, and they would have known exactly the amount of gas that was in the room during the night. Referring to Crossthwaite's evidence, his Lordship said he thought that the most likely thing that had happened was that air was blown in and a leak found; and, that the plug then being discovered, it was made tight, and so left without further test. However, that was a matter for the Jury to decide, and to say whether, if there was an escape of gas, it was caused by the negligence of the defendants' servants. If they found to this effect, they would have to consider the question of damages. A great deal of scientific and medical evidence had been called, and about the only common ground there was in the case was that Mr. Waters's right lung was in a bad condition. He often thought it would be better for scientific evidence not to be given upon oath; for, after all, a good deal of it was only matter of opinion, and it was wonderful how opinions changed according to one's interests.

The Jury retired, and, after a short deliberation, returned a verdict for the plaintiffs, with £500 for Mr. Waters and £20 for his wife.

Wednesday, Nov. 19.

Mr. PITMAN, this morning, asked that judgment might be entered in accordance with the finding of the Jury, with costs; also that these might be on the higher scale for the medical witnesses.

His LORDSHIP entered judgment for the plaintiffs, with costs, but declined to accede to the suggestion with regard to the scale.

Charges for Water for Building Purposes.

At the Kingsbridge County Court, last Tuesday, Henry Kerswill, builder, of Plymouth, was sued by the Salcombe Urban District Council for £6 12s. 6d., the value of water supplied for building purposes. The water was taken by meter at the rate of 6d. per 100 gallons; and evidence was given by the Surveyor and the Water Collector as to the meter being fixed and the money demanded. The defence was that the charge was too much. Defendant said that the charge in Plymouth was 2d. per 1000 gallons for domestic purposes, and 8d. per 1000 gallons for building. It was monstrous to charge 6d. per 100 gallons. It was shown that the charge was in accordance with the bye-laws; but it was agreed by the Council's representatives to accept £5 in settlement of the claim, and a verdict for this amount was given. Defendant had entered counter-claims of £12 for damages, and £50 for non-fulfilment of contract. The alleged cause of action arose in 1897; and it was pointed out by Mr. Windeatt, the Surveyor for the District Council, that, under the Public Authorities' Protection Act, all claims upon a public body must be made within six months of the time of the alleged injury. The Judge held that he had no power to hear the counter-claims.

Illegal Use of Water.

At the Warrington County Borough Police Court, on the 14th inst., Mr. Thomas Parkinson was summoned for using water for other purposes than those agreed upon. It was stated that the defendant occupied a dwelling-house at Knutsford; and on a Corporation inspector visiting the place, he found a hose-pipe attached to the kitchen tap delivering water to a barrel near a large boiler in the outbuildings, which was used for the purpose of cooking food for the pigs. Last July, defendant called at the water offices, and said that he had a horse and two cows for which he required extra water; but no mention was made of the boiler or the pigs. The defendant said he had no intention of defrauding the Corporation. There was a tap in the stable, but no water; and he had had to carry water from the house to the stable for the horses and cows. He thought he would save himself trouble by using the india-rubber pipe; and he did not see any harm in this. The Magistrates said they were of opinion that there had been a deliberate and contemplated fraud practised on the Corporation, and that it had been carried on for some time. They inflicted a fine of £3 and costs.

Gas Consumers' Excuses at Halifax.

Last Wednesday, some 97 persons had been summoned to appear before the Halifax Borough Magistrates, at the instance of the Gas Committee, in respect of the non-payment of their gas accounts. The majority of the cases had been settled out of Court. Those who attended urged varying excuses for non-payment; the reason generally advanced, however, being either lack of work or sickness. One defendant, who had run up an exceptionally large gas bill for a cottage house, laid the blame on to the gas-boiler. Another defendant, who was alleged to have been extravagant in the use of gas, pleaded that there was something wrong with the meter. She mentioned her suspicion, she said, to a Corporation official, who substituted a new one. The consumption of gas then decreased. Mr. J. T. Riley (one of the Magistrates) remarked that a lot of the Corporation meters were wrong. A third defendant, whose gas bill was considered high, had no fault to find with her meter. She had had considerable sickness, she explained, in the house. The result was that she had had to keep lights going throughout the night. The Chairman (Mr. John Oakes) suggested that, in a number of instances, it would be advisable for the Corporation to take out the present meters, and substitute slot meters. Mr. Bairstow (the Collector) stated that they were doing so in a lot of cases. One defendant, who owed only a few shillings, created some amusement when, in reply to the Magistrates' Clerk as to why the account had not been paid, she produced the money, and said that she had attended to pay now. The money was, of course, readily accepted by the Collector. Oscar Lee, of Hipperholme, denied his liability to pay an account of £5 15s. 2d. Its payment, he urged, had been guaranteed by Messrs. James Lee and Sons. He produced a letter bearing out his statement. Mr. Bairstow agreed, but said that Messrs. Lee and Sons had not paid; and thus the Corporation had had to come on defendant. Defendant, being asked if he burnt the gas, replied in the negative, stating that at the time the gas was consumed he was away at the front in South Africa. The house, he added, was closed while he was away. He accounted for the bill being run up by the fact that the gas was escaping, and asserted that he could produce plenty of evidence that the gas had been leaking at that time. His case was consequently adjourned. In the other cases in which no settlement had been effected, orders for payment were made; specified periods, however, being allowed defendants wherein to raise the money.

MISCELLANEOUS NEWS.

PUBLIC LIGHTING OF LAMBETH.

Award in the Arbitration between the Gaslight and Coke Company and the Borough of Lambeth.

An inquiry was held on the 26th of July last, by the Hon. T. H. W. Pelham, on behalf of the Board of Trade, for the determination of a question which had arisen between the Borough Council of Lambeth and the Gaslight and Coke Company, with regard to the price which the Company were entitled to charge in respect of gas supplied by them for public lamps supplied in the borough. The proceedings were reported in the "JOURNAL" at the time (*ante*, p. 292). It may be remembered that the question at issue was what was "the price for the time being charged by the South Metropolitan Gas Company for gas of the same illuminating power" as that supplied in Lambeth by the Gaslight and Coke Company; the price chargeable by the latter Company being (under the terms of the Scheme of Amalgamation whereby they absorbed the London Company) determined by that for the time being charged by the former. It was admitted by Counsel for the borough that they could not contend that since July, 1901, the price charged by the South Metropolitan Company for 14-candle gas could govern the price to be charged by the Gaslight and Coke Company for 16-candle gas. The question in dispute was therefore limited to the period comprised in the five quarters commencing in April, 1900, and ending in June, 1901.

The Board of Trade have now, we are informed, made known their opinion, and their decision is that the Gaslight and Coke Company were entitled to charge (as they did charge) in respect of gas supplied to public lamps within the borough of Lambeth at the rate of 2s. 4d. per 1000 cubic feet for the first quarter in dispute, and 2s. 8d. for the remainder of the period, and that these were the respective "prices for the time being charged by the South Metropolitan Gas Company for gas of the same illuminating power." The award is therefore entirely in favour of the Gaslight and Coke Company. The interesting point as to whether the Company are any longer in any way bound by the price clause in the Scheme of Amalgamation of 1883 is, however, not determined; the borough not contending, so far as their lamps are concerned, that the Company are so bound.

THE LONDON COUNTY COUNCIL AND GAS-TESTING.

Gas-Testing on Sundays and Bank Holidays.

At the Meeting of the London County Council last Tuesday—Sir JOHN M'DOUGALL in the chair—the Public Control Committee submitted the report with reference to the testing of gas on Sundays, of which the text was given in the last "JOURNAL" (p. 1353).

Mr. W. J. SQUIRES (Chairman of the Committee) moved the reception of the report; and the motion was carried.

The CHAIRMAN then moved that the recommendation of the Committee—viz., that they should be authorized "to take all necessary legal steps to secure the testing of gas by the gas examiners at the prescribed testing places on Sundays"—should be agreed to.

Colonel ROTTON expressed the hope that the Council would not take the very serious step recommended by the Committee without some further consideration. He said the report opened up one of the greatest questions the Council had ever had before them—viz., the introduction of Sunday labour. It would be in the recollection of the Council that two or three weeks ago he presented a petition, signed by nearly 400 of the leading members of the various churches in London, against the Sunday trading which went on under the sanction of the Theatres and Music Halls Committee. Now the Council were asked to open the door to the employment of a vast number of working men on Sunday, in consequence of the testing of gas which was proposed to be carried out by the Council on that day. He felt most strongly that this was a most serious step—such a step as they had never contemplated before; and he hoped the Council would think twice before they approved of the proposal. Who were the people who were complaining of the condition of the gas? It might be that it was not so good on Sundays as on other days. But, after all, the shops were not open, and there was not the same consumption of gas. He should imagine that every member of the Council would think that the gas men, at any rate on Sundays, had a right to have a day free. The Council insisted upon this. It appeared to him that if they determined to test the gas on Sundays, the men, who up to the present time had had a day of rest, would be obliged to work, in order to keep the gas up to the proper quality. He maintained that it was very much better to go on as now than to throw this extra labour upon men who so needed a day of rest, and who up to the present had had it, without any great complaint that he had heard of, either in the papers or anywhere else. It was not pretended that the public had complained so much against the condition of the gas that it was absolutely necessary for the well-being of London that the workmen should be employed on Sundays. He was not going to move any amendment, because he did not think it would be carried. He should simply content himself with voting against what he considered to be a most immoral proposal.

Mr. R. A. ROBINSON thought that the gas ought not to be tested on Sundays, and therefore he should move that the recommendation be referred back for further consideration. He did not think that the Committee had made out any case for indulging in the testing of gas on Sundays. As Colonel Rotton had truly said, there was not any large demand for this. He was not aware of any allegation whatever that the Gas Companies were not doing their duty on Sundays. When it was borne in mind that it meant a considerable number of men at work, and fires kept going, merely for the sake of knowing that the gas was pure on Sundays, he did not think a case was made out, seeing that it would entail so much labour. He thought gas might be tested on Saturday or Monday sufficient for all the Council's demands; and therefore they should not "take all the necessary legal steps" in order that testings might be made on Sundays. He did not think any case had been made out. In order that the question might be discussed, he begged to move, as an amendment—"that the recommendation be referred back to the Committee for further consideration."

Rev. FLEMING WILLIAMS said he should be pleased to second the amendment, for the reasons which had been so well explained by the mover. He had no objection to a man working on a Sunday if it was absolutely essential for the public welfare; but here the case was entirely different, as it appeared to him. If the gas could not be tested near enough to Sunday, and therefore it was essential, in order to secure the purity and adequacy of the illuminant on that day, then, of course, let it be tested on Sunday; but he thought a case should be made out before the Council were asked to commit themselves to the proposal before them.

Mr. H. WARD said he did not think there could be any doubt whatever that it would be a very wise thing indeed to have occasional tests on Sundays, and a small number would suffice. But it was quite certain that if the Council allowed it to go forth that there was a clear understanding that no tests would ever be made on Sunday, they would have a royal day for cheating. It was quite clear that the Gas Companies, by not enriching their gas, could supply a much poorer gas on Sundays than on any other day; but no deduction took place. He thought it would suffice if the Committee simply had power to test occasionally on Sundays. In this way, they would probably keep the Companies from doing something which was very non-Sabbatarian, and which they otherwise would do. It seemed to him, therefore, that what was proposed was a very wise course indeed; and he trusted the Council would adopt it.

Mr. W. C. JOHNSON assured the Council that the Committee had no wish in any way to encourage Sunday labour. This move had been forced upon them by the action of the Gas Companies themselves. He might remind the Council that this was not, as yet, a question of testing the gas for its illuminating value, but for its purity; and he would inform Colonel Rotton that it was not a question of ascertaining the candle power of the gas on Sunday, but whether or not the people of London were to be poisoned on that day. The case on which this matter arose was an action brought against the Commercial Gas Company, because in the manufacture of their gas they allowed to remain in it too large a quantity of sulphur. Under the Act, they might for two consecutive days have more than a certain quantity; and for the Council to be successful in prosecuting them, they had to prove that for three consecutive days this quantity had been exceeded. They found this had been done on Friday, Saturday, and Monday; and the Company were brought before the Magistrate. But as the test had not been taken on the intervening Sunday, the Council could not succeed. This had consequently checked the Committee in their efforts to secure the purity of the gas. Since then the matter had assumed greater importance; but he could assure the Council, on behalf of the Committee, that nothing would be done to cause an increase of Sunday labour, without its being absolutely necessary. Both he and the Committee were aware that the Gas Companies held a threat over their heads. But, strangely enough, the Gaslight and Coke Company allowed the examiners on the first Sunday to test the gas in their stations without protest; and they found that in only a very small proportion of instances was there any superfluity of sulphur. As the Company had no notice of the test, they employed no extra labour to keep the gas up to the standard. The Committee had every reason to believe that this was a got-up cry on behalf of the Companies, in order to frighten the Council and the Committee. He hoped the Council would accept the recommendation.

Mr. J. PIGGOTT said he should vote for the matter going back to be reconsidered, because, if he understood the report, the Council wanted to exercise their right to test gas on Sundays. He thought it was quite proper that they should test it occasionally on a Sunday, or else the Companies might poison them on that day. But when special examiners were appointed for the Sunday work, it looked as though the Council were going into a Sunday department.

Mr. SQUIRES: I wish to assure Colonel Rotton and every member of the Council that there is no desire at all on the part of the Public Control Committee to resort to Sunday labour.

Colonel ROTTON: You cannot help it.

Mr. SQUIRES said he hoped the Council would let this matter go through, because he felt there was a principle involved in it. They wanted to be sure they had the power and the right—and he believed the Solicitor would bear them out in this—to make Sunday tests of the gas. The question had been raised, with regard to two Companies, of imposing Sunday labour on their men, and by one Company very strongly—the Company who refused permission to the Council's examiner to make tests. Mr. Piggott had remarked that the Council were going to put Sunday labour in force. The Council agreed some few weeks ago that this would be a temporary matter for three or six months. He might say that the only desire on the part of the Committee was that temporary men might be appointed to make these tests. He knew the Committee were doing their very best to see that the public should have what they were entitled to; and he trusted the Council would support them.

On the amendment being put, it was declared to be lost; and the recommendation was then agreed to. The second report on the *agenda* was, by permission, withdrawn.

BIRMINGHAM CORPORATION GAS SUPPLY.

Outside Supplies—Extensions and Improvements—Financial Matters.

The Gas Committee of the Birmingham Corporation have prepared a report for presentation to the next meeting of the Council, in the course of which they state that they have, by agreement with the

Solihull Rural District Council and the Solihull Gas Company, undertaken to supply gas for public lighting within a portion of the area of supply of the Company, upon equitable terms. The area in question adjoins the township of Olton. An agreement has also been entered into with the Lichfield Gas Company for the supply of gas to a portion of the parish of Shenstone, Four Oaks, within the Lichfield area.

The Committee report that further capital is required to meet the large expenditure now incurred in supplying gas to small tenements under the prepayment meter system. The number of prepayment meters fixed per annum during the past five years has been: Year ended March, 1898, 1595; 1899, 2218; 1900, 3301; 1901, 3970; and 1902, 5292. The Committee are of opinion that the present demand for new supplies of gas under this system will continue for five years at least; and to meet the additional outlay thus occasioned, they estimated that a further £7000 of capital per annum will be required, or £35,000 for the five years ending 1906. They reported in February, 1898, that a further extension of gas producing plant, based on an increased consumption of 4 per cent. per annum compound, was requisite. To meet this, and to permit of the reconstruction of four old retort-houses at Saltley and Windsor Street, it was necessary to erect a new retort-house and other plant at Nechells and a new retort-house at Windsor Street. When completed, the Committee estimated that these extensions would enable them to meet the demand for gas up to and including the winter of 1903-4. So far their forecast has been verified. The Council assented to the proposals, and the erection of a 5 million cubic feet coal-gas plant at Nechells was undertaken, and completed in October, 1900; and thereafter the reconstruction of the retort-houses at Saltley, each of 2½ million feet capacity per diem, was commenced. One of these has just been completed, and is now in operation; and the second will, it is anticipated, be ready for use next year. The portions of the 1898 scheme of extensions which have not yet been undertaken, comprise: New retort-house at Windsor Street to produce 1,250,000 cubic feet per diem; reconstruction of two retort-houses at Windsor Street, 2,000,000 cubic feet; reconstruction of Adderley Street works, 2,250,000 cubic feet—total, 5,500,000 feet.

On July 19, 1900, a statement was submitted to the Local Government Board with particulars of requirements on which the application for further powers to borrow £500,000 was based. This was amended on Jan. 20, 1901, reducing the application to £410,000 by the withdrawal of proposals to reconstruct the Adderley Street works, estimated to cost £90,000. Subsequently, the acquisition of land at Birches Green for gas-works purposes enabled the Committee to review the question of works extensions, and it was decided that the erection of a new retort-house, the reconstruction of two old retort-houses, and the provision of additional purifying plant at Windsor Street, estimated to cost £112,000, should also be deferred. Considerations of space and convenience led the Committee to this recommendation, and their attention has been directed to the Nechells works, which were planned to permit the erection of a second retort-house with a producing capacity of 5 million cubic feet per diem, estimated to cost £184,750. When the existing 5 million plant was erected, a sum of £21,000 was expended, as authorized by the Council, in providing buildings and plant in anticipation of this further extension; so that the present proposed outlay will only be £163,750. The Committee, therefore, desire to withdraw the portion of the 1898 scheme dealing with the extensions and reconstructions at Windsor Street and Adderley Street, estimated to cost £202,000, and in place thereof they recommend that a retort-house, of 5 million cubic feet capacity per diem, with purifying and other plant, be erected at Nechells, at an estimated cost of (say) £165,000. They recommend that they be authorized to apply to the Local Government Board for power to borrow, for the erection of the plant at Nechells, £165,000; and to meet the cost of installing prepayment supplies, £35,000—together, £200,000.

DARLINGTON GAS-WORKS EXTENSIONS.

The Darlington Town Council, at their last meeting, had before them an exhaustive report by the Gas Engineer and Manager (Mr. F. P. Tarratt) on the necessity for extending the works. After pointing out that the increase in the quantity of gas made during the three months ending Michaelmas, as compared with the corresponding period of last year, was 14·17 per cent., Mr. Tarratt went on to say that he was certain they would be taxed to their very utmost to make all the gas that would be required by the town during the present winter. Every setting of retorts would be at work, which was a condition of things that should not exist on any works, especially a town of the size and importance of Darlington, where so many industries were absolutely dependent on their giving an adequate supply of gas. As it was impossible to add to the producing power of the existing works with advantage, he asked the Gas Committee to proceed with the development of the land purchased for gas-works extensions on the north side of the Stockton and Darlington railway, immediately adjoining the gasholder tank, at present in course of construction, and erect there a complete works, which might be in readiness for operation in the winter of 1904-5. The Committee, having considered this report, recommended that steps be taken to obtain a Provisional Order to authorize the Corporation to borrow the further sum of £100,000 for the purposes of gas-works extensions. Alderman Barron, in moving the adoption of the Gas Committee's minutes containing this recommendation, said the amount they proposed to ask power to borrow was, of course, far in excess of what they wanted immediately. They obtained power to borrow £50,000 in the last Provisional Order; but this had been absorbed, and they proposed now to ask power to borrow a sufficient sum of money to last the town for some years. Of course, every application to borrow under the powers would have to be inquired into in the usual way. Mr. Stairmand seconded. Mr. Oliver said he was sorry it had been found necessary to get this Provisional Order. The Gas Committee had enabled them to reduce the rates to the extent of 10d. or 11d. in the pound; but if this scheme was carried through, and unless there was a large increase in the consumption of gas, the ratepayers in the next two or three years might look to an increase of 7d. in the pound. He was only sorry the Committee had not the nerve to do what they should have done a year or two ago—put down a plant for manufacturing water gas. They were frightened by the medical gentlemen, for very few of them were experts on carburetted water gas or coal gas. He entered his protest against what he considered a waste of public money in being compelled to spend £100,000 when £7000 would certainly have done. Alderman Barron remarked that the Council had already decided not to erect a water-gas plant. The report was then adopted.

FATAL GAS EXPLOSION AT MAIDSTONE.

Shortly after ten o'clock last Friday night, a loud explosion took place on the bridge crossing the Medway at Maidstone. It caused the upheaval and breakage of the heavy paving-stones on the bridge for a distance of about 60 feet on one side of it, and serious injury to two men who were crossing at the time, one of whom has since died. The lights in the part of the town on the east side of the river went out, and about ten minutes after the explosion, escaping gas on the bridge ignited and flared up to a considerable height. On these accounts, it was immediately turned off at the works. On examining the mains, of which there were two, 18 inches in diameter, suspended in a 6 feet wide subway under the footpath, it was found that they were both fractured for a distance of about 40 feet. The explosion was apparently caused by the firing of a mixture of gas and air in the subway or space between the arches and the pavement; but where the gas came from, and how it was ignited, remains to be accounted for. During the night, the fractured pipes were temporarily replaced by others 12 inches in diameter; and the town had its usual supply of gas by nine o'clock next morning. The damaged mains were put in 23 years ago, when the bridge was built; and the only change which has recently taken place has been the removal of the gas-lamps and the substitution of electric ones for them.

ORIENTAL GAS COMPANY, LIMITED.

The Ordinary General Meeting of the Company was held last Wednesday, at the London Offices, Finsbury House, Blomfield Street, E.C.—Mr. R. Hesketh Jones in the chair.

The Secretary (Mr. H. J. Luff) having read the notice convening the meeting, the report and accounts, which were summarized in the "Journal" last week, were taken as read.

The Chairman, in moving their adoption, said the second paragraph of the report referred to two matters—an increase in the rental, and an improved rate of exchange. On this subject he would call attention to the balance sheet; and first he might point out that the Indian rupee was, and had been, during the entire existence of the Company, calculated as worth 2s. sterling. At one time, and for a very short period, the actual value of the rupee exceeded 2s.; but if they turned to the Directors' report seven years ago, it would be seen that the proprietors were reminded of the continued great depreciation in the value of the rupee. In the balance-sheet for 1895, the item for exchange amounted to no less than £28,939, against £17,565 last year. This led the Board to initiate an exchange equalization account, which stood at £16,250 in the accounts now presented. But the proprietors would notice that no addition had been made thereto this year; and for this reason: Fortunately, since the exchange equalization account was established, there had been a considerable improvement, and, for the last two years, the rupee had been worth very close upon 1s. 4d. Now, taking the last year's accounts, if they had been rendered at 1s. 4d. currency, instead of 2s., the debit to revenue account for exchange would have been only the odd £65 7s. 5d., instead of £17,565 7s. 5d. He might say that he had gone very carefully into this question, and he found that, if the accounts for the past year had been calculated at 1s. 4d. to the rupee, there would still have remained about £8500 to the credit of the exchange equalization account. He mentioned this so as to assure the proprietors that the Board had more than protected the Company against the loss on exchange, and as a reason why this account had not been added to during the year under review. The next paragraph in the report referred to the completion of the conversion of the public lighting from the old-fashioned flat-flame burners to the modern incandescent mantle system. This had been done in pursuance of the Company's proposals to the municipal authorities, which were accepted and embodied in the new contracts alluded to in the Directors' reports of 1900 and 1901. It was all-important that the Company should secure the public lighting, seeing that it formed the greater part of the consumption of gas in Calcutta. The proprietors were no doubt cognizant of the fact that there was a Calcutta Electric Light Company, and that that Company naturally desired to acquire the public lighting, or, at any rate, a good slice of it. The Gas Company, on their side, were reluctant to part with their long-established business in the supply of gas for public lighting; and the Board had therefore spared no exertion or expense to retain their connection with the public lighting authorities. Thanks to their Manager (Mr. D. C. Niven) and staff in Calcutta, they had succeeded; and, as the report stated: "In the public thoroughfares of Calcutta may be seen lamps of a type equal, if not superior, to any in the streets of London." The next paragraph referred to the conversion of the shares into stock. The Directors had, during the past twelve months, had to call the proprietors together to two extraordinary general meetings to approve of this scheme; and they had been much gratified at the confidence which had been shown by an unanimous approval of their proposals. But an unforeseen and unexpected difficulty was raised by the Committee of the Stock Exchange, or the new stock certificates would have been in the hands of the proprietors in the beginning of the present month. That was the Directors' intention; but, after having

prepared the new certificates, signed and sealed them, the Board were confronted with a requisition that they should put upon the face of the certificates the amount of the Company's capital (£300,000), and that the Company was "Incorporated under the Companies Acts," notwithstanding the fact that the name of the Company is "The Oriental Gas Company, *Limited*." One did not complain of the Committee of the Stock Exchange protecting the public as far as they could against mushroom or bubble companies; and if the Directors had known of the existence of any—and he believed unpublished—rule as to the form of stock certificate which the Stock Exchange preferred, they would have cheerfully complied with it. As it was, delay and inconvenience to some of the proprietors, and especially to the Secretary and staff, had arisen, all of which had now been surmounted by arranging that all the certificates (except the first 1000) should have the words "Capital £300,000" and "Incorporated under the Companies Acts" inserted thereon. The quotation was granted on Monday last; so that the new certificates could now be exchanged for the old ones.

Mr. H. D. ELLIS seconded the motion.

Mr. EDWARD CLARK said he was happy to be the possessor of several thousand pounds of the Company's stock; and he was very pleased to think the dividend had been amply secured, because it was obvious the great bugbear they had years ago on account of exchange was, according to the Chairman's statement, adequately provided for, and anyhow at the present time there would be a surplus sum of £8000. This being so, he would like to submit for the Directors' judgment—not at all in any antagonistic spirit—whether the time had not now arrived when, having altered the capital, and simplified it in the way they had done, they might have their dividends more equally distributed. Earning, as they did amply, 8 per cent. (he believed the year's accounts would show nearly 10 per cent.), he suggested whether the proprietors should not have an interim dividend of 4 per cent., and he hoped they might look forward to at least 4 per cent. in the second half of the year. There was no Company that he knew of who paid 3½ per cent. at one time and 4½ per cent. at another. A fluctuation in dividend of that sort, and the suggestion that the Company had only enough for an interim dividend of 3½ per cent., was distinctly against the market value of the stock. Although he did not wish to draw too strong an argument from this, still he might say that it was a good thing for the proprietors to see the stock quoted and appreciated by the public at as high a mark as possible. It might be recollected that it was at the instance of the late Mr. Besley and himself that the capital was simplified in the way it had been; and he was sure it would prove to be greatly to the interests of the proprietary. It would now be very gratifying if the Board could see their way to alter the interim dividend as he suggested.

The CHAIRMAN thanked Mr. Clark for the friendly character of his remarks, and said he fully appreciated his desire to have an interim dividend of 4 per cent. and a 4 per cent. one to wind up with. But it was by no means an unusual thing to have a smaller dividend for the interim than the final one.

Mr. G. F. THOMPSON asked whether there would be any objection to showing in the balance-sheet how the reserve fund was invested.

The CHAIRMAN stated that he did not think there would be.

A PROPRIETOR inquired if the reserve fund was all in sterling, and invested on this side.

The CHAIRMAN replied that it was, and read a list of the investments, with which the proprietors expressed their satisfaction.

The motion was unanimously carried.

Moved by the CHAIRMAN, and seconded by Mr. R. MILLER, a dividend of 8 per cent. for the year was declared, free of income-tax, and less the 3½ per cent. paid on account on June 4 last.

Mr. W. WILLIAMS proposed, and Mr. A. T. EASTMAN seconded, the re-election of Mr. R. Hesketh Jones to his seat at the Board.

The proposition having been heartily agreed to,

The CHAIRMAN moved that Mr. R. Miller be re-elected to the Board. He mentioned that Mr. Miller, who was acquainted with Calcutta, was going to visit that city early in the year. While there, he would do the Company the favour of visiting the works and conferring with Mr. Niven, and then would report generally on their affairs on his return.

Mr. ELLIS seconded the motion, which was cordially agreed to.

The Auditors (Mr. S. W. Savage and Mr. F. Seel) were also re-appointed.

On the motion of Mr. CLARK, seconded by Mr. THOMPSON, the Chairman and Directors were heartily thanked for their services during the past year.

The CHAIRMAN, in acknowledging the compliment, said, in the two years that he had had the honour of occupying the chair, there had been a considerable alteration in the Company's circumstances. They had been able to secure the public lighting of both Calcutta and Howrah upon terms most advantageous to all parties. In both places, the public lighting was on a much better footing than before; and, as he had said, it was now equal, if not superior, to that of any locality in London. This had been effected, new Articles of Association adopted, the capital reduced, and the shares had been converted into stock, which, as Mr. Clark knew, necessarily made it much more favourable for Stock Exchange quotations and to deal with than heretofore, and now the stock was one might say a *quasi*-trustee stock. It was not quite, but it was as good as, a trustee stock. Therefore, he could claim that the Company stood in a much better position now than they did even two years ago. Proceeding to propose that the proprietors accord to the Manager and staff in Calcutta and the Secretary and staff in London a hearty vote of thanks, he said that Mr. Niven co-operated with the Directors most cordially in the rearranging of the public lighting, and entered into the matter with the greatest enthusiasm. The Secretary, too, had also devoted himself most loyally to, and had accomplished most efficiently, the work that had devolved upon him in connection with the reorganization of the Articles of Association, and the reduction and conversion of the capital.

A suitable response from Mr. Luff, on behalf of himself and Mr. Niven, concluded the proceedings.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 1402.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
590,000	10	Oct. 15	10½	Alliance & Dublin 10 p.c.	18—19	..	5 10 6
100,000	10	,,	7½	Do. 7 p.c.	12½—13½	..	5 11 1
300,000	100	July 1	5	Australian 5 p.c. Deb. .	100—102	..	4 18 0
200,000	5	Nov. 13	6⅔	Bombay, Ltd.	5¾—6*	..	5 8 4
40,000	5	,,	6⅔	Do. New, £4 paid	4—4¼*	..	5 15 6
380,000	Stk.	Aug. 14	12	Brentford Consolidated	248—253	..	4 14 10
270,000	,,	,,	9	Do. New . . .	180—185	..	4 17 3
50,000	,,	,,	5	Do. 5 p.c. Pref. .	125—130	..	3 16 11
206,250	,,	June 17	4	Do. 4 p.c. Deb. .	111—114	..	3 10 2
220,000	Stk.	Sept. 11	10⅔	Brighton & Hove Orig.	207—212	..	5 1 5
246,320	,,	,,	7⅛	Do. A. Ord. Stk. .	152—157	..	4 18 9
460,000	20	Sept. 26	10	British.	40—41	..	4 17 6
50,000	10	Aug. 14	12	Bromley, Ord. 10 p.c. .	22—24	..	5 0 0
82,850	10	,,	9	Do. 7 p.c. . . .	18—20	..	4 10 0
500,000	10	Oct 15	7	Buenos Ayres (New) Ltd.	10—10½	..	6 13 4
250,000	Stk.	June 24	4	Do. 4 p.c. Deb.	93—95	..	4 4 3
150,000	20	July 11	8½	Cagliari, Ltd. . . .	21—23	..	7 3 6
100,000	10	Sept. 26	10	Cape Town & Dis., Ltd.	14½—15½	..	6 9 0
50,000	50	Nov. 3	6	Do. 6 p.c. 1st Mort.	53—55	..	5 9 1
550,000	Stk.	Oct. 15	12½	Commercial Old Stock	260—265	..	4 14 4
251,875	,,	,,	9½	Do. New do. .	200—205	..	4 12 8
271,875	,,	June 12	4⅞	Do. 4½ p.c. Deb.	130—134	..	3 7 2
800,000	Stk.	May 28	8†	Continental Union, Ltd.	138—143	..	5 11 11
200,000	,,	,,	7	Do. 7 p.c. Pref.	142—146	+1½	4 15 11
575,000	Stk.	Aug. 28	5⅓	Crystal Palace Ord. 5 p.c.	118—123	..	4 6 8
60,000	,,	,,	5	Do. 5 p.c. Pref. .	120—125	..	4 0 0
106,158	,,	July 11	5	Do. 5 p.c. Deb. Stk.	139—142	+1	3 10 5
486,090	10	July 30	10½	European, Ltd. . . .	17½—18½	..	5 13 6
354,060	10	,,	10½	Do. £7 10s. paid	13—14	..	5 12 6
15,243,200	Stk.	Aug. 14	4	Gas-light and Coke — 4 p.c. Ord. . .	87—89	−1	4 9 11
2,600,000	,,	,,	3½	Gas-light and Coke — 3½ p.c. max. .	88—90	..	3 17 9
3,799,735	,,	,,	4	Gas-light and Coke — 4 p.c. Con. Pref. .	110—112	+1	3 11 5
4,193,975	,,	June 12	3	Gas-light and Coke — 3 p.c. Con. Deb.	91—93	−1	3 4 6
70,000	10	Oct. 20	8	Hongkong & China, Ltd.	14½—15½	..	5 3 3
3,800,000	Stk.	Nov. 13	10	Imperial Continental .	200—203*	..	4 18 6
473,600	Stk.	Aug. 14	3½	Do. 3½ p.c. Deb. Red.	99—101	..	3 9 4
561,000	Stk.	Aug. 28	10	Liverpool United A .	223—226	..	4 8 6
718,100	,,	,,	7	Do. do. B .	165—167	..	4 3 10
306,083	,,	June 24	4	Do. do. Deb. Stk.	116—118	..	3 7 10
75,000	5	June 12	5	Malta & Medn., Ltd. .	4¼—4⅜	..	5 5 3
560,000	100	Oct. 1	5	Met. of Melbourne — 5 p.c. Deb.	104—108	..	4 12 7
250,000	100	,,	4½	Met. of Melbourne — 4½ p.c. Deb.	102—104	..	4 6 7
541,920	20	Nov. 13	5½	Monte Video, Ltd. . .	9—10*	..	7 0 0
1,515,892	Stk.	Aug. 8	4½	Newc'tle & G'tesh'd Con.	104—105	..	4 5 9
346,855	Stk.	July 4	3½	Do. 3½ p.c. Deb.	99—100	..	3 10 0
300,000c	Stk.	—	8	Oriental, Ltd. . . .	145—150	..	5 6 8
60,000	5	Sept. 26	7	Ottoman, Ltd. . . .	6½—7	..	5 0 0
					* Ex div.		
851,070	10	Oct. 15	7	River Plate Ord. . .	10—10½	..	6 13 4
300,000	Stk.	June 24	4	Do. 4 p.c. Deb..	92—94	..	4 5 1
250,000	10	Sept. 26	8	San Paulo, Ltd.. . .	11⅛—12½	..	6 8 0
135,000	Stk.	Sept. 11	10	Sheffield A	236—238	+1	4 4 0
200,984	,,	,,	10	Do. B	235—237	..	4 4 5
523,498	,,	,,	10	Do. C	233—235	..	4 5 1
6,000,000	Stk.	Aug. 14	5⅓	South Met., 4 p.c. Ord.	120—123	−1	4 6 8
1,700,000	,,	July 11	3	Do. 3 p.c. Deb. . .	91—93	..	3 4 6
380,940	Stk.	Nov. 13	5	Southampton Ord. . .	103—107*	..	4 13 6
87,950	,,	July 11	4	Do. 4 p.c. Deb.	102—105	..	3 16 2
120,000	Stk.	Aug. 28	6	Tottenham and Edmonton — A. 5 p.c.	118—123	..	4 17 7
302,520	,,	,,	4⅓	Tottenham and Edmonton — B. 3½ p.c.	93—96	+1	4 13 9
182,380	10	Jan. 16	5	Tuscan, Ltd.. . . .	7—8	..	6 5 0
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	96—98	..	5 2 0
230,000	5	Aug. 14	5½	West Ham, 10 p.c. . .	10—11	..	4 6 4
172,000	10	,,	6⅔	Do. 7 p.c. . .	13½—14½	..	4 9 8
				WATER COMPANIES.			
780,599	Stk.	June 24	11⅓	Chelsea, Ord. . .	310—320	..	3 11 11
150,000	,,	,,	5	Do. 5 p.c. Pref. .	152—157	..	3 3 8
160,000	,,	,,	4⅔	Do. 4½ p.c. Pref. '75	140—143	..	3 2 11
175,785	,,	Sept. 26	4⅔	Do. 4½ p.c. Deb. .	137—142	..	3 3 5
1,720,560	Stk.	Oct. 15	8	East London, Ord.. .	214—218	+½	3 13 5
654,740	,,	June 12	4⅓	Do. 4½ p.c. Deb. .	142—147	..	3 1 3
1,282,913	,,	,,	3	Do. 3 p.c. Deb. .	97—99	..	3 0 7
700,000	50		8	Grand Junction — 10 p.c. max..	110—115	..	3 9 7
310,000	Stk.	Sept. 26	4	Grand Junction — 4 p.c. Deb..	125—130	..	3 1 7
708,000	Stk.	Aug. 14	14	Kent	290—300	..	4 13 4
160,000	,,	,,	7	Do. New, 7 p.c. max..	195—205	..	3 8 4
1,043,800	100	June 24	11	Lambeth, 10 p.c. max..	298—303	+1	3 12 7
406,200	100	,,	8⅓	Do. 7½ p.c. max..	215—225	+5	3 15 7
350,000	Stk.	Sept. 26	4	Do. 4 p.c. Deb..	125—130	..	3 1 7
500,000	100	Aug. 14	12,5/6	New River, New Shares	385—393	..	3 4 9
1,000,000	Stk.	July 30	4	Do. 4 p.c. Deb..	125—130	..	3 1 7
902,300	Stk.	June 12	7	Southwark and — Ord. . . .	195—200	..	3 10 0
126 500	100	,,	7	Southwark and — 7½ p.c. max.	180—185	..	3 15 8
489,200	Stk.	,,	5	Southwark and — 5 p.c. Pref.	153—156	..	3 4 1
1,019,585	,,	Oct. 15	4	Vauxhall — 4 p.c. A Deb.	123—128	..	3 2 6
1,155,066	Stk.	June 12	10	West Middlesex. . .	280—290	+5	3 9 0
200,000	,,	,,	4⅓	Do. 4½ p.c. Deb. .	139—144	..	3 2 6
200,000	,,	Sept. 11	3	Do. 3 p.c. Deb. .	95—97	..	3 1 10
					* Ex div.		

† Next dividend will be at this rate.

ELECTRIC LIGHTING NOTES.

A Costly Bargain for Newton Abbot.

At the meeting of the Newton Abbot District Council yesterday week, the Lighting Committee brought up a report recommending the acceptance of the offer of the Urban Electric Supply Company, Limited, to light the town for £900 a year, and that a contract for ten years be entered into determinable at the option of the Council at the end of five or seven years. The £900 is to include the whole cost of installing, providing, lighting, and maintaining lamps and plant of every description, except that the Company may convert and use the present lamp posts. Should additional lamps be required, they are to be provided at a price stated in the Company's estimate; but new lamp-posts, except for arc lights, are to be provided and paid for by the Council. Every lamp is to give continuously the amount of light specified; and a penalty is provided for any breach of the agreement in this respect. Mr. Parker, the Chairman of the Committee, who moved the adoption of the report, said they would get a much better light without any increase on the present cost. Arc lamps were far superior to any incandescent gas-lights. Mr. Judd, who seconded the motion, remarked that the outlying portion of the town would now be lighted, as the Company promised to carry the cable wherever the Council fixed lamps. Mr. Wright contended that the tender of the Gas Company should also have been brought before the meeting. The Gas Company would provide exactly the same light for £6 8 a year. Why should they pay £200 a year more, and bind themselves for ten years to the Electric Light Company, whom they did not know? It was all very well for the Chairman of the Committee to go to Ventnor; but the people knew he was coming, and naturally everything was prepared to make a good impression. No one would say that Newton Abbot was badly lighted at present, or point to any advantage which would result from having arc lamps. Mr. Murrin said he thought the electric lighting of Torquay very inferior; the arc lights being poor, and the small glow lights wretched. At Ventnor, the lighting was better; but there the 32-candle power incandescent electric lights were not as good as the ordinary incandescent gas-lights. The Company offered Newton Abbot 40-candle power Nernst lights for the small lamps; and this would make the town the best lighted in the kingdom. Mr. Martin, referring to the question of cost, said that, though they paid the Gas Company £900 last year, this was an expenditure in excess of the twelve months, and was quite an abnormal sum, because of the high price of gas then prevailing. He suggested that the signing of the contract should be deferred, and that in the meantime the Gas Company should try the experiments which they offered. The Chairman (Mr. W. Vicary) supported this, and said that though electric light might be the light of the future, it was not as cheap as gas. An amendment in favour of postponement was rejected, and the Committee's report was adopted by a majority of the Council.

GLASGOW CORPORATION WATER SUPPLY.

Utilization of Loch Arklet.

On Friday, the 7th inst., an inquiry ordered by the Secretary for Scotland, under the provisions of the Private Legislature Procedure (Scotland) Act, 1899, was opened in Glasgow in connection with an application made to him by the Corporation for his consent to the granting of a Provisional Order to sanction, among other things, power to substitute for the dam, 25 feet high, across the foot of Loch Arklet, authorized by their Water Act of 1885, another, 22 feet high, about one mile farther down the valley. The reason for the alteration was that it had been found that the site of the original dam was such that it could only be constructed with much difficulty and at great cost. The Duke of Montrose objected to the proposed change, on the ground that, as he consented to the 1885 scheme, his sanction should be obtained before the Corporation were granted powers to change. The negotiations for his Grace's consent broke down because the price wanted was higher than the Corporation were prepared to pay. The Commissioners were the Right Hon. W. E. Macartney, M.P. (Chairman), Mr. G. M'Crae, M.P., Mr. A. Gordon, and Mr. W. J. Mure, with Mr. J. Campbell Lorimer as Clerk.

Mr. Balfour Browne, K.C., and Mr. Salvesen, K.C., appeared for the Corporation; Mr. David Dundas, K.C., Mr. James A. Clyde, K.C., and Mr. R. L. Blackburn represented the Duke of Montrose.

Mr. Balfour Browne, in his opening statement, traced the history of the water undertaking in Glasgow. He recalled the provisions of the Act of 1885, under which the Corporation were to pay the Duke of Montrose £3000 for the privilege of storing water in Loch Arklet. They were also to pay him for the land they required, and for damage done to his estate. No period was prescribed for the completion of the works. The raising of Loch Katrine 5 extra feet was completed in June, 1901, and, with the supplementary conduits to Glasgow, the work cost the Corporation £1,300,000. The total yield, with what they calculated to get from Loch Arklet, would have come to 75 million gallons a day; but the two aqueducts which had been constructed enabled them to carry to Glasgow, if they had the water, 100 or 110 million gallons. The works which were to be constructed under the Act of 1885 for the utilization of the waters of Loch Arklet were a dam at the west end of the loch, not very far from where the loch itself terminates, and it ran across a valley at a point very close to the loch. When they came to make borings along the proposed site of the dam, they ascertained that the foundation was most unsuitable. The choice of that site for a dam was a serious mistake; and this was the foundation of the Corporation's present application. Their whole object was to make a really good reservoir on Loch Arklet, and they were informed that at no reasonable sum of money could this be effected by carrying out the works proposed in 1885. If they had to put a dam where it was originally intended, in order to get a foundation

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at all, they would have had to arrange to sink right through peat moss, gravel, and sand to get to rock at a very great depth indeed. Under the old scheme, the height of the water was to be raised 25 feet; now, by carrying the dam a good deal farther down, and spreading it over a larger surface, they would be able to get the same quantity by raising the water only 22 feet. The embankment they originally proposed to construct would have been 1800 feet long; the one they now intended to build was 993 feet in length. The only thing there was any real difference in, so far as he could see, was this—that they would have to take more land from the Duke of Montrose than formerly. By having the dam farther down than the one proposed in 1835, they would have to purchase 355 acres of land—about 100 acres more than they contemplated acquiring under the old scheme. It was not first-class land by any means—simply bog and high hill pasture; but whatever it was, his Grace would be fully compensated for it. That the wants of Glasgow were to be met by Loch Arklet had been already decided by Parliament, and the Duke had assented; and the only question was which was the best way to use it—by a bad dam in a bad position, or in a more economical way by a good dam. It was merely a question of compensation; and the Corporation could pay what the Duke wished. But he protested against his Grace standing in the way of an undoubted improvement, in the interests of the ratepayers of Glasgow, merely because they had to take 100 acres of bog land. The consumption of water in the city was increasing rapidly; and they believed the present resources would be exhausted in 1907. It might probably take the interval of time involved to carry out the works in question.

The following evidence was then given:—

Mr. *G. H. Hill* said he was Resident Engineer during the carrying out of the Glasgow Water-Works, which were began in 1854. The construction of the dam authorized in 1885 would cost a prohibitive sum, and, in addition, there would be large contingencies. In every sense the site was objectionable. The estimate of 1885 would not have looked at the work; witness had made a very rough estimate, which brought out £165,000. The site now proposed was the proper one. The works would be cheaper and free from the contingencies of those of 1885. He had read the Duke of Montrose's petition, and did not see any point therein that could not be fairly met by compensation.

Cross-examined by Mr. DUNDAS, witness said that in his estimate of £116,000 for the works now suggested, he had taken into account the compensation to be paid for the additional ground. The selection of the site for the embankment in 1885 was a mistake.

Mr. DUNDAS said, whether it was right or wrong, it was a very deliberate selection of a particular site as against other sites; and Mr. Gale had the fullest information before him. He (Mr. Dundas) suggested that Mr. Gale knew very well that if he had asked the Duke of Montrose to consent to the scheme now tabled, his Grace would not have done so, and the Bill would not have gone through.

Mr. *W. Gale*, junr., one of the Assistant-Engineers of the Corporation, examined by Mr. SALVESEN, said no water had yet been drawn from Loch Arklet; and if the consumption increased in the same ratio as during the past few years, the Loch Katrine supply would cease in 1907. It was absolutely necessary that the works at Loch Arklet should be begun now, if they were to be ready by that time. He concurred with Mr. Hill that the site of the 1885 dam was not very convenient. He estimated the total cost of the construction of the works proposed in the present Order at £110,000, including the conduit through Loch Arklet to Loch Katrine and the dam. The dam alone, under the 1885 scheme, would, in his opinion, have cost about £157,000; and the approximate cost of the other works then authorized would be about £27,000—a total of £184,000, as against £110,000 for the new scheme. The cost of the present works could be very accurately gauged, because there was rock quite near the surface.

Mr. *W. R. Copland* gave corroborative evidence. He said there was no comparison between what was proposed now and in 1885. The present scheme was the more eligible and the more satisfactory in every way. He did not know whether or not the consent of the landowner had been obtained; but, for identically the same reason as here, in a reservoir in connection with the Edinburgh Water-Works the dam was shifted about a mile down the stream. He did not see that the landlord could justly object to an Order being altered to his detriment, if he was treated in the ordinary way—by compensation.

Mr. *W. Crouch*, Consulting Engineer to the District Committee of the Middle Ward of Lanarkshire in connection with their water scheme, strongly recommended the adoption of the new site.

Mr. *J. Mansergh* said that if the present Order was granted, it would not in any way increase the storage capacity of the works as compared with those authorized in 1885, though they would slightly increase the drainage area. His experience was that, without a case of reasonable need of water, Parliament would not give a corporation or community compulsory power to interfere with property. Promoters of schemes of this kind must prove necessity. He thought it was rather likely to have been some question of policy in regard to the agreement that led Mr. Gale to fix the site of the dam in 1885. In cross-examination, he admitted that the right place to put the dam was the one now selected, and said he would not recommend the Corporation to carry out the works as proposed in 1885.

Mr. *G. S. Carfrae* said if Mr. Gale selected the less suitable site, he must have had some good reason for doing so. He regarded it as a merit of a scheme from a proprietor's point of view, that it interfered less with his land. If this were the view at the time the scheme was proposed, it struck him as having something to do with Mr. Gale choosing the site he did. The submerging of part of the land in the new scheme would render the adjoining ground unsuitable for feuing, owing to the difficulty of constructing a sewer to clear the loch.

Some further evidence having been given, the proceedings were adjourned till the next morning, when

The *Duke of Montrose*, examined by Mr. DUNDAS, gave a narrative of the negotiations which had taken place between his Chamberlain and Solicitors and the Corporation of Glasgow in 1884 with a view to

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BUFFALO, N.Y.	2,000,000
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YORK	750,000
ROCHESTER	500,000
KINGSTON, ONT.	300,000
CRYSTAL PALACE DISTRICT	2,000,000
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the carrying out of the scheme of the following year—the only one he had sanctioned. He saw that it would give Glasgow the water they wanted, and at the same time cause a minimum of damage to his estate. Of course, a certain amount of meadow ground would be taken, but a substantial area would still remain. Personally, he would have much preferred to have the loch left as it was. His Chamberlain wrote to the Corporation to this effect in connection with the original scheme, and added that as his Grace did not wish to stand in the way of Glasgow having water, which would prove a great boon, he was willing to sacrifice his feelings in the matter, and allow the Corporation to have what they wanted at a fair price. When he gave his consent to that scheme, his understanding was that it was a final and definite arrangement; and he had no conception that, having obtained a footing on Loch Arklet, the Corporation would go to Parliament at some later time and ask to be allowed to alter the whole scheme of works. In 1892 again, he and the Corporation had certain negotiations with the view of extinguishing his feuing rights within their water area, and there was no suggestion then that the scheme of 1885 was to be altered. If he had been asked in 1884 to agree to such a scheme as the one now proposed, he should never have sanctioned it, on the ground of the injury it would have done to his estate. In his opinion, it would be vastly more injurious than the scheme of 1885.

In cross-examination by Mr. BALFOUR BROWNE, witness said he was anxious that the Corporation should save money, if they could do it legitimately. By moving the dam farther down the valley, the whole of the meadow land would be taken, and sheep farming on three farms could not be carried on as at present. Under his leases, he would have to take over the sheep at a valuation. They would be thrown upon his hands, and he would have to sell them in the market. It would also interfere with his feuing ground, and, for all he knew, with the fishing in Loch Arklet. He admitted that the first injury, in regard to the farms, was merely a question of money; he had never heard any suggestion of compensation for the sheep. It was true that compensation for that and the loss on the feuing might be given under the Lands Clauses Act; but it was prospective, and one could not tell what the loss might be.

Mr. BALFOUR BROWNE: If I can convince you that, as regard farms, sheep, and feuing, the loss could be met by money compensation under the Lands Clauses Act, will you be satisfied?

Witness: No; but that would do away with most of my objections.

Mr. DUNDAS then addressed the Commissioners, and asked that the preamble of the part of the Order affecting his Grace's land might be found not proved. He said this was not merely a landlord's opposition, which could be met by money compensation. It was a very peculiar case. To find the preamble proved of this part of the Order would be, in the first place, entirely unprecedented; in the second place, absolutely unnecessary; and, in the third place, unjust and contrary to parliamentary policy and practice. It was not sufficient in an undertaking of this kind to say that it should be carried out simply for the purpose of saving money, and, moreover, the amount involved in the change was a mere drop in the bucket in connection with the water supply of Glasgow. It was not the case that the people were thirsty; they were merely greedy.

Mr. BALFOUR BROWNE urged that it could not be to the advantage of anyone to construct the dam on the old site. To do so would mean that £50,000 would be thrown away, which would be a serious matter, and not, as described by his friend, "a drop in the bucket." The Corporation were bound, under the Lands Clauses Act, to give full compensation to his Grace. There was nothing unprecedented in what was proposed. It had been done in fifty different cases by Act of Parliament. There was urgent necessity for water; this was decided in 1885. It was estimated that in 1907 there would be required for the Glasgow water area 66 million gallons per day; and without Loch Arklet there would only be 65 millions. It was not merely a question of saving expense, but of doing the right thing and not wasting money.

The Commissioners retired to consider their decision. On returning to the Court after an absence of twenty minutes,

The CHAIRMAN said: We consider the preamble proved, and the elements mentioned on behalf of the Duke of Montrose proper subject for compensation; but they are, in our opinion, covered by the Lands Clauses Act. If there is any doubt on behalf of the Duke, we will consider a clause prepared by parties to carry this into effect.

PROPOSED INCREASE OF WATER CHARGES AT WALLASEY.

A Local Government Board inquiry was held by Mr. E. P. Burd at Egremont last Tuesday into an application of the Wallasey Urban District Council for a Provisional Order to amend the Wallasey Improvement Acts, 1858 and 1864, so as to increase the maximum percentage of the water rent for domestic purposes to a higher amount than 6 per cent., to be charged on the gross estimated rental instead of the annual value of each house. The Clerk to the Council (Mr. H. W. Cook), in support of the application, said the present maximum rate which could be charged by the Council for water for domestic purposes was an annual rent not exceeding 6 per cent. on the annual value of the house in respect of which such supply of water was afforded. The capital expenditure on the water-works up to the present was £128,064; and the amount of outstanding borrowing powers was £51,595. Last March, the Water Committee handed over £3786 to the relief of the rates. The Council had made an agreement with the Liverpool Corporation to take a supply of water from Vyrnwy; and this necessitated 34 miles of pipe-line being laid. The cost of this work would be £146,000, which had been borrowed from the Liverpool Corporation, repayable within thirty years, while Wallasey would further have to pay 1 per cent. for maintenance of the water-main when laid. This interest, the sinking fund, and the maintenance charges were

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calculated at 6½ per cent., making £9490 per annum in all. Wallasey agreed to take a minimum of half-a-million gallons of water a day at 6d. per 1000 gallons, which meant £4562 10s. per annum. In addition to all this expenditure, there were local works, reservoirs, water-pipes, mains, &c., being carried out at a cost of £47,667, involving annual charges of £2259, and making total charges of £16,311 10s. a year, which represented, upon the basis of a penny rate producing £1300 per annum, a sum of 1s. 1d. in the pound. The existing wells of the district had a daily supply of over 2 million gallons; but there was always the possibility of the water suffering through the wells being so close to the sea, in which case the maximum supply of 2¼ million gallons could be taken from Vyrnwy, but at an additional cost of £15,973. Taking the first scheme, the sum of £16,311 10s. would fall upon the Council; and in order to place the burden in some degree upon the shoulders of the consumers, the Council now asked that the charge for domestic supply might be increased from 6 to 10 per cent. per annum—an amount which was allowed by Parliament in the case of the Aberystwith Water Act, 1872. On this percentage a sum of £9776 beyond the present income would be realized; and if 7½ per cent. were allowed, £3403 would be raised. There was also, on the average, an increase of about £1000 a year in water receipts. There was no intention of raising the rate for other than domestic supplies. Even if the 10 per cent were charged, this would realize only the amount required for the principal and interest on the Vyrnwy scheme, leaving the £4502 10s. cost of actual supply and interest on other water loans to be raised in some other way. The estimated population of the district was 55,000, and the assessable value £330 781.

Mr. T. V. Burrows, the Chairman of the Water Committee, questioned by Mr. Cornish, who opposed on behalf of the Wallasey Land and House Owners' Association, said he thought the household consumers should bear the greater burden of the extra cost. The charge to meter consumers was 1s. 2d. per 1000 gallons. For the year ended March last the revenue from water charges was £19,754, of which £6139 was for trade purposes. It was true that during the last five years there was an average of £4000 per year paid in relief of the rates; and going back 22 years the average surplus was about £2000 a year. Mr. Richard Steel, the Chairman of the Finance and Parliamentary Committees of the Council, said that, finding they wanted so much money, they considered the means for raising it; and discovering precedents for a 10 per cent. charge, and also for taking the gross rental as the basis, they deemed it desirable to apply for both, simply as enabling powers. He made out that the extra burden would be about equal to 1s. 0½d. on the general district rate; and by placing the charge as far as possible on the consumers, there would still be, he estimated, a deficiency on the first financial year of about £2449, equal to nearly 2d. on the general district rate, which would have to meet the deficiency. The charge for trade purposes was as high as it could be put to be remunerative. In reply to Mr. Cornish, witness said the Council would be almost sure to charge the maximum percentage, at any rate for a time. The present charge for trade purposes would still give the Council a large profit; and if the rate was increased, tradesmen might get their water elsewhere. Indeed, he knew that the Dock Board had considered the question of sinking a well to obtain a private supply. The choice for the district was between an addition of 1s. 1d. in the pound to the general district rate, and an extra water charge with an addition of 6d. or 8d. to the general district rate. If the first alternative was chosen, it would have a disastrous effect on the district. Mr. J. H. Crowther, the Engineer of the water-works, said it would be unwise to raise the trade charges, out of which the Council now made the greater proportion of their profit. In 1898, the domestic consumption was 495 million gallons and the revenue £10,882, and the trade supply was 90 millions and the revenue £6360. The gross cost of raising the water was 5·88d. per 1000 gallons. Mr. Witter, a ratepayer, quoted Liverpool, and appealed for an arrangement whereby the extra cost should be borne to some extent by the landlord as well as by the tenant. The Inspector remarked that this was a question of law, with which he had nothing to do. Mr. Cornish said the application was really intended to benefit one section of the ratepayers at the expense of the rest. It would benefit the trade consumers, who represented about one-third of the total number. During the last 22 years, the general district rate had benefited from water profits by £44,000. All this long period the traders had been, as it were, partners in the profits; and now it was proposed to exempt them from sharing in the losses. Mr. Cook, in reply to Mr. Cornish, said that even if the maximum was raised to 10 per cent., there would still be a deficiency to be covered by the general district rate, a portion of which would fall upon those having trade supplies. The Council proposed to level up the householders, who had been paying a minimum charge, while not increasing the charge to the traders, who had practically been paying a maximum charge all along.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Town Council of Falkirk have this week, with deliberation, set back the hands of the clock, in the adoption, by a majority of one, of a motion rescinding their resolution of Jan. 11, 1901, in which they adopted the Thornhill site for new gas-works. That site was selected, on the recommendation of Mr. A. Gillespie, of Glasgow, in preference to one at Parkhouse, in consequence of its larger area and of the subsoil being more suitable; but it was subject to the procuring of railway facilities to it that Mr. Gillespie favoured it. The Council have, after great delay, come to an agreement with the North British Railway Company for the construction of a railway which would serve the new gas-works; and the Company have given notice, within the past two weeks, of their intention to apply for parliamentary powers to make

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the railroad. There has been a half-heartedness all along in this matter of the new gas-works, discussions as to which have been going on for at least seven years. During this time, something ought to have been accomplished—the works, in fact, should have been in going order by now; but while there was a general desire to see new works erected, there was a division as to the locality of them, and thus progress was made slow. Shortly after acquiring the gas undertaking, it was perceived that it was necessary to provide increased plant for the manufacture and storage of gas, and ground at Parkhouse was purchased, upon a corner of which a new gasholder was erected, and was inaugurated about the end of 1896. There was then practically no doubt in the mind of anyone that gas-works could be erected at Parkhouse which would be quite satisfactory, both in practice and in finance. But Bailie Hamilton ceased to be Convener of the Gas Committee, and there was a change in the office of Gas Manager. There followed a time in which nothing was done as to the new works; but at the end of 1899, the Corporation took up the matter with more earnestness. By this time, Thornhill had come to be the favourite site, and it has remained so until the recent municipal election, when two new members entered the Council and turned the balance. It was unfortunate for the promoters of the Thornhill site that they had not enough wind wherewith to fill their sails, because, with such, they would ere now have accomplished their purpose. They have failed, in reality, upon the question of site, though the argument used in support of the proposal to rescind the resolution was that it led to the perpetuation of a level railway crossing over a thoroughfare in which there is considerable traffic. But while the level crossing was the bugbear, not one of the new majority would, even when called upon, face the subject of the agreement with the Railway Company. The railway is to be made; but there are to be no gas-works for it to serve. It turns out that its primary purpose will be to serve the works of the Falkirk Iron Company, which, it may be, explains the weakness with which the Thornhill site has all along been supported. There was a long discussion in the Town Council on Monday last, before the decision was come to to give up the Thornhill site. If there were any arguments used in support of the proposal to rescind, they were to the effect that the Etna Foundry Company were opposed to the level crossing because it would prevent their workmen from getting in and out; that the agreement bound the Corporation entirely to the North British Railway Company, and debarred competition; and that, seeing that the introduction of electricity would tend to lessen the consumption of gas, they should be in no hurry in the building of new gas-works. Against these, it was pleaded that the Corporation could only deal with the North British Company, as that Company held an agreement with the Caledonian Railway Company that they were not to compete for traffic in that district; and that the rate of increase in the consumption of gas was such that new gas-works would be a necessity before they could be erected.

I have said that the motive in the proceedings which culminated on Monday night has been the defeat of the Thornhill site. This was shown by the circumstance that, before taking up this subject, the Council were moved to remit to a Committee to consider as to whether properties adjoining the present gas-works could not be purchased, upon which to extend the works. The idea is to erect a coal-store upon the ground, and to extend the present retort-house. The proposers of the remit believe that the properties may be acquired at moderate cost, and that the extension will enable them to tide over many years to come. It seems that Provost Weir proposed the purchase of the properties six years ago. The price which it is likely will have to be paid, if the properties be taken, was mentioned variously at £10,000 or £20,000. In opposition to the proposal, it was argued that it was time to have done with tinkering at the gas-works, and that, according to all the authorities who have been consulted, it is expedient that new works altogether, on a new site, should be erected. An argument in support of the proposal, which should not be lost sight of, is that the Corporation could erect stores upon the ground without parliamentary authority. Provost Weir explained that what was proposed was to try to get a little more room until new gas-works could be built. By the same vote—eight to seven—and almost by the same voters, the remit was carried.

The actions in the Court of Session regarding the building of the new gas-works at Granton have both been now disposed of—one by settlement and the other by decision. They really arose out of differences between the Contractors' interests, and need not have gone the length they did but for the temper which the Contractors displayed. Lord Kyllachy indicates as much in his opinion, which is a wonderfully clear one upon a case in which there were multitudinous details. Last month the Gas Commissioners found themselves in a position to make admissions; and then the amount left in dispute was so small that it was possible to settle it by a payment of £105.

A little incident is developing itself in a leisurely way in the Kirkcaldy Sheriff Small Debt Court, in which the endeavour is being made by the Kirkcaldy Gaslight Company, Limited, to recover £1 12s. 3d. as the amount due for gas consumed by William Collins, of Rosslyn Street, between Dec. 10. 1901, and March 22, 1902. The defence is that all the gas charged for was not consumed, but that, on account of a leak in a pipe in the garret of the house, part of it was lost. Sheriff-Substitute Gillespie had the case before him on the 12th inst., when he listened to an argument upon the question as to whether it was the landlord or the occupier of the house who was liable. He continued the case till the 19th inst., and then it was pleaded by the Solicitor who represented the Company that it was the occupier who was their customer—they had nothing to do with the landlord. The Sheriff pointed out that the occupier pleaded the break in the pipe; but the Solicitor replied that it was not the Gas Company's pipe, and that the occupier could sue the landlord for loss sustained in consequence of defective fittings. The Sheriff thought it would be better to hear some further argument upon the

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question of liability, which was one of some importance. He then ordered the case to be intimated to the proprietor of the property, and continued the case for debate. We are not permitted to criticize cases which are *sub judice;* but the remark may be made here that the Sheriff has decided to call the landlord into a cause to which he is not a party. He may, after hearing both sides, decide that the landlord is not liable, but that the occupier is. But if he should decide that the landlord is liable for a portion of the gas which passed the meter, it is difficult to understand how decree could be given against him, seeing he is not in the summons.

We have not yet heard the last of the Perth gas bill question. The subject was before the Gas Committee at a meeting on Wednesday, and, after considerable discussion, they agreed that circulars should be issued to those who refuse to pay, requesting them to state, within seven days, their reason or reasons for their action. This looks like a waste of time. The Corporation have a certificate from Mr. Thomas Newbigging that the bills which are being charged have been regularly incurred. What reasons can there be for non-payment? None that can be of any force. The Committee are bound to recover that money from the consumers, or they can make the amount good out of their own pockets. I suppose they will not think of doing the latter. And so, in their public capacity, administering statutes for the regulation of the supply of gas, it is their duty to see that all that is legal be done. It is not in their power to make one man pay up in full, and let another off with part of the charge against him, merely because he makes a poor mouth.

The Water and Gas Committee of the Dundee Town Council recently considered an application by the Arbroath Town Council as to whether they would be prepared to sell the Crombie reservoir. Mr. G. Baxter, the Water Engineer, submitted a report, in which he pointed out that the Crombie works were not, as had been stated, disused, but continued to assist in the supply of Dundee, as they had been doing during the past 34 years, and, in addition, were also supplying large volumes of water to Carnoustie. He had therefore no hesitation in recommending the Dundee Water Commissioners not to sell the works under any consideration, but endeavour to negotiate a fair and reasonable arrangement, whereby they might help Arbroath, and also conserve the interests of Dundee. The Committee agreed to follow the recommendation of the Engineer.

The Town Council of Grangemouth have, since the election, considered the subject of the water supply to the town and district, and have resolved to go in for the Bannoch Burn scheme, which I have already mentioned. Under it they will get daily a supply of 1,823,000 gallons of water for consumption, and 917,000 gallons for compensation. This is so ample a supply that it is estimated that in forty years they will only be requiring half of the available bulk. A reservoir to hold 115 million gallons is proposed, with a draw-off at a height of 435 feet above sea-level, which will enable the highest tenements in the district to be served. The cost is estimated at £60,800, which will require a water-rate of 2s. 1¾d. in the pound.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Nov.* 22.

Sulphate of Ammonia.

The week opened quietly, but later the demand improved, and the market closes with a firmer tone at £11 7s. 6d. per ton f.o.b. Hull, and £11 11s. 3d. per ton f.o.b. Liverpool and Leith. Buying has been mainly for prompt delivery, but there has also been a fair amount of business done at spot prices for December delivery. For delivery further ahead, makers' quotations are £11 15s. per ton, ordinary terms, f.o.b. Leith, and £11 17s. 6d. per ton, Beckton terms, London; but there are still speculative sellers abroad at a substantial discount on these prices, and their action tends to discourage buyers.

Nitrate of Soda.

This is steady on spot at 8s. 10½d. to 9s. per cwt., according to quality; but for spring delivery, ordinary quality may be had at 8s. 9d. per cwt. from middlemen.

LONDON, *Nov.* 22.

Tar Products.

The demand continues good, and prices, as a rule, are fairly well maintained. In pitch, high prices continue to be paid for home consumption, and during the last week large contracts have been passed in South Wales for January-June delivery at very good prices. There is a little better inquiry for anthracene; but makers will not at present accept the prices offered by consumers, preferring to abandon the production of the article rather than sell forward at existing prices. Crude carbolic is quiet. The market for 60's is rather weaker, as sales are reported by dealers, for export, at 1s. 8d. The position of crystals is, however, rather better; there being an improved demand for 39-40's. But consumers will not pay any advance on existing values for forward delivery. There is still a fairly good demand for benzol, especially for prompt delivery. Sales are reported in the North at 8¼d. in 50-90's for export, while 9d. has been paid in London for 90 per cent. prompt shipment. In creosote, the market continues firm as regards London; but in the Provinces there is rather more offering—makers being anxious to place the bulk of their winter make. The demand for export is still good; but buyers will not at present pay the prices asked by the London makers for forward delivery.

The average values during the week were: Tar, 20s. to 25s. 6d. Pitch, London, 55s. 6d. to 56s. 6d.; east coast, 53s. to 54s.; west coast, 51s. 6d. to 53s. Benzol, 90 per cent., 8¼d. to 9d.; 50-90 per cent., 7¾d. to 8¼d. Toluol, 6½d. to 7d. Crude naphtha, 2¾d. to 3¼d.; solvent naphtha, 8¼d. to 9¼d.; heavy naphtha, 9d. to 10d. Creosote, London, 1¾d.; North, 1⅜d. to 1⅝d. Heavy oils, 2d. Carbolic acid, 60 per cent., 1s. 8d. to 1s. 8½d. Naphthalene, 40s. to 55s.; salts, 23s. 6d. to 26s. Anthracene, "A," 1½d. to 1¾d.; "B," 1d. nominal.

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PREVENTS NAPHTHALENE DEPOSITS.

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Among the Companies and Towns supplied are The Gas Light and Coke Company, The South Metropolitan Gas Company, Birmingham, Leeds, Rochdale, Bristol, Sheffield, Southport, Alloa, Broughty Ferry, Dunfermline, and many other Works, both large and small, where they have been working in some instances for the past Seven Years.

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Dealers in Benzol, Carburine, and all other Naphthas and Oils suitable for the Enrichment or Production of Gas.

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Sulphate of Ammonia.

There is a decidedly better tone in the market; and more business has been done during the past week. The Gaslight and Coke Company are reported to have declined £11 11s. 3d., and now ask £11 12s. 6d. for December delivery and £11 15s. for January-March. Another London Gas Company accepted lower prices early in the week, but are now very firm in their ideas. In Hull, a fair business has been done at £11 8s. 8d. for early shipment, which is about the value; but makers will not, as a rule, accept less than £11 10s. for December shipment, and at present decline to quote for January-June. In Liverpool, business has been done at £11 10s. for prompt shipment; but the demand is scarcely so brisk. In Leith, several sales have been made at prices varying from £11 10s. to £11 11s. 3d.; while business has been done at £11 12s. 6d. f.o.b. Glasgow. The tone of the Leith market is firmer; and there is more inquiry for forward delivery.

COAL TRADE REPORTS.

Lancashire Coal Trade.

The wages question is just now engaging prominent attention. That the Conciliation Board meeting last Wednesday would be unable to come to any agreement, was a foregone conclusion. It is pretty well known that the application put forward by the Miners' Federation for an advance in wages is merely intended as a counter-move to the coal-owners' application for a further reduction of 5 per cent. The Arbitrator, Lord James, will now have to decide the matter, and the coalowners are confident that they have a sufficiently strong case to secure the further concession in the rate of wages they have applied for. The spell of something like winter weather during the past week has necessarily brought forward some increased inquiry for house-fire qualities. But Lancashire house-fire coals range from 15s. to 16s. per ton, seconds 13s. 6d. to 14s. 6d., common 10s. 6d. to 11s. 6d., with ordinary qualities of steam and forge coal about 8s. 6d. to 9s., and some inferior sorts as low as 8s. For shipment, common sorts of steam coal can be bought at about 10s., with good ordinary descriptions averaging 10s. 6d. to 10s. 9d., delivered at the ports on the Mersey. Engine fuel is still generally plentiful on the market; but there is perhaps not quite that pressure with surplus output at the excessively low-cut figures ruling a week or so back. The best qualities of Lancashire slack are generally firm at about 6s. 6d. to 7s. per ton, medium sorts average about 5s. 6d. to 6s., with common slack 4s. 6d. to 4s. 9d., and some low-class qualities to be bought at about 4s. to 4s. 3d.

Northern Coal Trade.

The coal trade is generally steady. There are still some American shipments to be made, so that the collieries are now likely to be well employed for the next few weeks. The demand for best Northumbrian steam coals is very good for this season, and the price is relatively firm at from 11s. 3d. to 11s. 6d. per ton f.o.b. Second-class steams are 10s. to 10s. 6d., and steam smalls are 5s. 6d. to 6s. Work at the pits is fairly brisk, and the output of the miners is now more steady. For gas coal, the demand is now about at its fullest, and the deliveries on the long contracts take up so much of the production of the best descriptions that the collieries producing this kind ask high prices for the remainder of the output. Durham gas coals vary from 9s. 3d. to 10s. per ton f.o.b., according to quality; but for contracts, the prices are a little easier when the time of delivery is over an extended period. Gas coke is still rather scarce, with a very varying price—from 13s. to 14s. per ton f.o.b. being in some cases quoted.

Scotch Coal Trade.

The continued openness of the season is favouring export, and consequently there is a large volume of business. Winter seems, however, to have arrived, and the result will be a cutting off of northern ports, and a decline in shipping orders. The home demand is very good; it being reported that nearly all the collieries are well booked till the end of the year. Prices have scarcely varied during the week. These are: Main 9s. 3d. to 9s. 6d. per ton f.o.b. Glasgow, ell 10s. 3d. to 11s. 3d., and splint 10s. 6d. to 10s. 9d. The shipments for the week amounted to 257,521 tons—an increase of 327 tons upon the previous week, and of 72,810 tons upon the corresponding week of last year. For the year to date, the total shipments have been 9,708,388 tons—an increase of 970,783 tons upon the same period of last year.

Chertsey Gas Consumers' Company.—The fortieth annual meeting of this Company was held last Wednesday, when the accounts presented, for the year ending Sept. 30 last, showed a balance of £2785 available for distribution; and the Directors recommended the payment of the maximum dividends—viz., 11½ per cent. on the original shares, and 8½ per cent. on the "D," "E," and "F" shares. This was agreed to. At the close of the ordinary business, the meeting was made special, for the purpose of considering a resolution varying the original Articles of Association of the Company, and adopting a new and amended set in lieu thereof. They were approved of.

Sale of Shares.—At the Mart, Tokenhouse Yard, last Tuesday, Mr. Alfred Richards offered for sale, by order of the Directors, new issues of stocks and shares in the Wandsworth and Putney Gas Company and the North Middlesex Gas Company. The former was an issue of £10,000 of ordinary "C" stock, ranking for a standard dividend of 3½ per cent., subject to the sliding-scale; the last dividend on the existing "C" stock having been at the rate of £5 5s. per cent. per annum. It fetched from £110 to £115 per £100 of stock. The North Middlesex Company's issue was a sufficient number of ordinary £10 shares to realize, with the premiums, £2515, and £1800 of 4 per cent. perpetual debenture stock. The shares fetched from £13 15s. to £14 each; and the stock, £102 10s. and £103 per £100 lot. On the same occasion some £5 shares in the Sunbury Gas Company, carrying 5 per cent. dividend, realized £5 and £5 5s. each.

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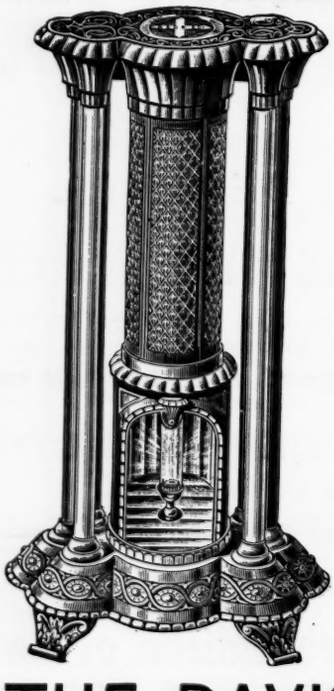

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Sale of the Attleborough Gas-Works.—Last Tuesday, in accordance with the announcement which had appeared in our columns, Mr. Alfred Richards invited offers, at the Mart, Tokenhouse Yard, E.C., for the above-named works, some particulars in regard to which were given in the "JOURNAL" for the 28th ult. Considerable interest was shown in the sale; many gas engineers and others concerned with the gas industry being present. The bidding started at £1200, and rose to £1825, at which price the property, which is freehold, was sold.

Gas and Water Losses at Llandudno.—On the instruction of the Gas and Water Committee of the Llandudno Town Council, the Clerk has presented a detailed account of the causes of the loss of £642 shown on the year's working of the gas undertaking, and of £118 on the water-works. He says he has come to the conclusion that the loss in each case was entirely due to the increase in the sums falling under the head of repayment of principal and interest on loans—the amount in the gas undertaking having during the year gone up from £1635 to £2614 for this purpose, and on the water-works from £3274 to £3733.

Asphyxiated by Gas.—The occupants of a house in Rose Hill Street, Heywood—John Henry Taylor, his wife, and three children—were found lying in bed in an unconscious condition last Friday, owing to an escape of gas in the kitchen. Several doctors were soon in attendance, and for upwards of two hours they endeavoured to restore respiration artificially. In the case of Mrs. Taylor and one of the children they were unsuccessful. Mr. Taylor and the other children were unconscious on Friday night; but it was hoped they would recover. Last Sunday week, at Wolverhampton, a married couple named Griffiths were found lying unconscious in their kitchen, both having been overcome by an escape of gas. The efforts of the doctor who was called in were successful in bringing the woman around; but the man unfortunately succumbed. The street in which the accident happened had recently been metalled.

Outrage on a Watchman at Messrs. R. & J. Dempster's.—A daring outrage was committed at Newton Heath, Manchester, last Friday night. Shortly after eleven o'clock a man named Pickles, employed as a watchman at the works of Messrs. R. & J. Dempster, Limited, was sitting in the lodge near the entrance gates of the works, when he was seized by two men who came behind, pinned him by the arms, and threw a coat over his head. They then tied him in his chair, and, in this way, carried him across the yard into the boiler-house, where they left him. Though tightly bound, Pickles eventually managed to wrench himself free, but not until he had been left in this state for about a couple of hours. He then went in search of a policeman, and finding one near, the two returned to the works. On examining the offices, they discovered that an attempt had been made to blow open the safe by means of some powerful explosive, but that the attempt had been unsuccessful. Pickles cannot give any description of the men who attacked him. The police have been making active inquiries into the matter.

Further Issue of London Water Stock.—Tenders were received last Tuesday by the Southwark and Vauxhall Water Company for as much 3 per cent. intercommunication debenture stock as would produce £140,000. Tenders at 95¾ received 68 per cent. of the amount applied for, and those above in full.

The Bellshill Gas Company, Limited, was registered in Edinburgh last week. The Company has been formed, with a capital of £13,000, in £1 shares, to acquire the undertaking of the existing Company.

Messrs. Joseph Taylor and Co., of Bolton, have obtained orders for solid plate lead saturators, braced with pitch pine laggings, for the Guildford Gas Company and the Wallasey Urban District Council.

The Tullamore Gas Company, Limited, has been registered, with a capital of £2700, in 540 shares of £5 each, for the purpose of taking up the old Company of the same name, and being registered under the Act of 1862.

The Corporation of London have placed an order with the James Keith and Blackman Company, Limited, for a 2000-candle power Keith light, to be fixed on an existing column at Ludgate Circus; the compressor being fixed in the lavatories underneath.

The Sanitary Publishing Company, Limited, announce the issue at an early date of a work on the subject of public lighting, entitled, "Public Lighting by Gas and Electricity," by Mr. W. J. Dibdin, F.I.C., F.C.S., &c. Embellished by numerous illustrations, diagrams, and tabular statements, the contents will occupy 528 pages.

The annual *conversazione* and dance of the employees of Messrs. R. & A. Main, Limited, took place in their "Gothic" works at Falkirk last Friday evening. A dramatic sketch was presented by the ladies of the staff; and Mr. J. A. Maclay, the Commercial Manager of the Company, gave one or two humorous readings. Mr. A. P. Main was present, and addressed the gathering.

On five occasions, from the 9th to the 15th inst., the gas of the Gaslight and Coke Company was below the standard, according to the return, for the week ending at the latter date, made to the London County Council by Dr. Frank Clowes, F.I.C., their Chief Chemist and Superintending Gas Examiner. The figures ranged from 15·92 down to 15·79 candles at the Millbank Street station; while at Camden Street, on the 15th inst., the return was 15·50 candles.

In the "JOURNAL" for the 11th inst., we noticed some of the awards made at the Health Exhibition held in connection with the Congress of the Sanitary Institute in Manchester. In addition to the firms then mentioned, we are pleased to find that the Davis Gas-Stove Company, Limited, secured a silver medal for their "Diamond" cooker, and a bronze medal for their "Thistle" griller. They were the only firm who obtained awards for gas-cooking appliances.

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In view of the increasing use of the camera, for professional and other purposes, by gas managers, attention may be usefully directed in our columns to a useful set of cards which are being issued by the Editors of "The Photogram." They comprise the following: (1) Guide to Correct Exposure in Outdoor Work and Copying. (2) Table of Enlargements and Reduction Telephoto Rules. (3) Directions and Chart for Fixing the Time of Best Lighting of any View. (4) Thermometer Scale and Photographic Temperatures. (5) Weights and Measures, British and Metric. (6) How to see Stereoscopic Slides without a Stereoscope. A set of these cards, which are of a size suitable for the pocket-book, will be sent for a penny stamp.

The Power Gas Company recommend the payment of dividends at the rate of 6 per cent. per annum upon the ordinary shares and 4 per cent. per annum upon the deferred shares.

We have received from the Cambridge Scientific Instrument Company, Limited, a pamphlet they have just published on "The Measurement of Temperature by Electrical Means." Thanks to the work of Professors Callendar and Griffiths, electrical methods of measuring temperature are becoming very generally adapted to commercial purposes; and the pamphlet under notice furnishes information in regard to the instruments available. It is very well printed—the illustrations coming out with remarkable clearness.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

SITUATIONS VACANT.

CLERK. Ilford Gas Company.
ENGINEER AND MANAGER FOR PERU. Lee & Nightingale, Liverpool.
GAS-FITTER. Aberavon Gas Department. Nov. 29.
GAS-FITTER. Oswestry Gas Company.
GAS-FITTER. Wigan Gas Department.
MAIN AND SERVICE LAYER. Redditch Gas-Works.
SLOT METER INSPECTOR AND COLLECTOR. Aldershot Gas Company. Nov. 28.

SITUATIONS WANTED.

ASSISTANT TO GAS ENGINEER. No. 3948.
TAR AND AMMONIA DISTILLER. No. 3949.
TRAVELLER GAS-STOVE TRADE. Howland, Faversham.

AGENT WANTED BY GERMAN MANUFACTURER. No. 3939.

PLANT, &c. (Second-Hand), FOR SALE.

EXHAUSTER AND GASHOLDERS (various). Wright, London.
LANTERNS AND CRADLES. Paddington Lighting Department.
PURIFIERS, SCRUBBER-WASHERS, GASHOLDERS, &c. Firth Blakeley, Dewsbury.
RAILS, TURNTABLES, WAGGONS, &c. Beatson, Derby.
STATION METER (5000 Feet per hour). Hexham Gas-Works.

PLANT, &c. (Second-Hand) WANTED.

TANK AND GASHOLDER. Wright, London.
PURIFIERS. Bangor Gas Department. Dec. 15.

SALES OF STOCKS AND SHARES.

ALDERSHOT GAS AND WATER COMPANY. Dec. 2.
EASTBOURNE GAS COMPANY. Nov. 29.
GREAT YARMOUTH WATER COMPANY. Dec. 9.
LEA BRIDGE GAS COMPANY. Dec. 2.
NEWCASTLE AND GATESHEAD GAS COMPANY. Dec. 8.
NEWPORT (Mon.) GAS COMPANY. Dec. 12.
READING GAS COMPANY. Dec. 2.
SOUTH ESSEX WATER COMPANY. Dec. 9.
WANDSWORTH AND PUTNEY GAS COMPANY. Dec. 2.

TENDERS FOR

BRICKWORK FOR RETORT ARCHES AND CHIMNEYS.
BURY GAS DEPARTMENT. Tenders by Dec. 13.

COKE STORAGE HOPPERS.
BURY GAS DEPARTMENT. Tenders by Dec. 13.

CONDENSERS.
WALLASEY GAS DEPARTMENT. Tenders by Dec. 18.

EXHAUSTER AND ENGINE.
WALLASEY GAS DEPARTMENT. Tenders by Dec. 18.

GASHOLDER (Adding Lift to).
PONTYPRIDD GAS DEPARTMENT. Tenders by Dec. 15.

IRONWORK FOR RETORT-HOUSE.
BURY GAS DEPARTMENT. Tenders by Dec. 13.

PIPES AND FITTINGS.
ALDERSHOT GAS AND WATER COMPANY. Tenders by Nov. 28.
PADIHAM GAS DEPARTMENT. Tenders by Nov. 28.

PURIFIERS.
BANGOR GAS DEPARTMENT. Tenders by Dec. 15.

RETORT-HOUSE FLOOR, &c.
WALLASEY GAS DEPARTMENT. Tenders by Dec. 18.

SULPHURIC ACID.
SALFORD GAS DEPARTMENT. Tenders by Nov. 27.
ALDERSHOT GAS AND WATER COMPANY. Tenders by Nov. 28.

TAR AND AMMONIACAL LIQUOR.
ALDERSHOT GAS AND WATER COMPANY. Tenders by Nov. 28.
HORNSEY GAS COMPANY.

TAR-EXTRACTOR AND SCRUBBER-WASHER.
WALLASEY GAS DEPARTMENT. Tenders by Dec. 18.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

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COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

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